Metals Review

VOLUME XX •• No. 12 DECEMBER 1947

INSTRUMENTATION ISSUE

Featuring

Instruments
and Their Application

By Orval L. Linebrink

Research Engineer

Battelle Memorial Institute

Some important developments as described in recent technical literature (with reference to source numbers in the Review of Current Metal Literature).

Instrumentation

Equipment for metallurgical process control, with some notes on modern laboratory devices, as described by the manufacturers.

NOTABLE LECTURES

Reported This Month

Samuel Epstein describes experiments that pointed to nitrogen rather than oxygen as the cause of strain aging . . . Leon Olberg installs equipment and performs hardenability test on the platform at Puget Sound meeting . . . Henry Heyn describes functions of dew point recorder and atmosphere gas generator without involving the complexities of the phase rule . . . Modern demands for higher properties focus increased attention on the unusual metals, says Bruce Gonser . . . H. J. French demonstrates how divergent performance of equivalent steels can be traced to heat treatment . . . M. A. Grossmann defines various states of stress and shows how the metallurgist can apply certain data in selecting the best material for adverse stress conditions . . . John Wulff shows how lead grids within powder compacts reveal deformation, hence density.

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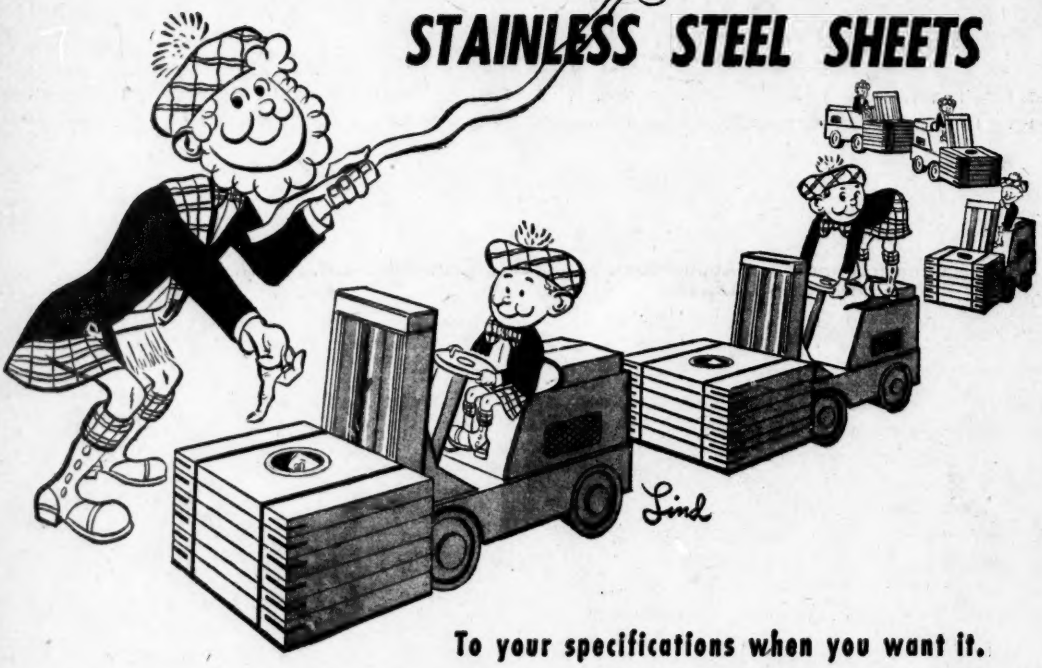

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Metals Review

Vol. XX, No. 12

Published monthly by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio; Francis B. Foley, President; Harold K. Work, Vice-President; William H. Eisenman, Secretary; E. L. Spanagel, Treasurer; Arthur E. Focke, John E. Dorn, E. G. Mahin, C. M. Carmichael, Trustees; Alfred L. Boegehold, Past President. Subscriptions $5.00 per year ($6.00 foreign). Single copies $1.00. Entered as Second Class Matter, July 26, 1930, at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

December 1947

RAY T. BAYLESS, Publishing Director MARJORIE R. HYSLOP, Editor GEORGE H. LOUGHNER, Production Manager

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Instruments and Their Applications

As Reported in Recent Literature

By Orval L. Linebrink

Research Engineer, Battelle Memorial Institute

WHEN SURVEYING the literature pertaining to instruments and their applications, one is immediately impressed by the vastness of the subject. All fields of industry, as well as research, are dependent upon instruments in one way or another. The extent of that dependence in Great Britain (11-54, Sept. 1946)* as well as in the United States (13-4, Feb. 1947) is definitely on the increase with the never-ending demands for more precise measurements with faster and closer controls (11-64, July 1947).

Management is constantly looking for instruments which will facilitate the production of more and better articles at lower cost. Thus, management, as well as the technical staff of any industry, needs to know something of the field of instrumentation. The type and range of usefulness of the instruments that will apply to a particular process or operation are very important. Knowledge of the basic fundamentals (11-54, June 1947) of instruments leads to more efficient use and operation, as well as to the development of new instruments and applications (13-9, March 1946).

Temperature Measurement and Control

The various processes and operations in which temperature measurement and control are involved are so numerous that approximately one half of all instruments manufactured are of this type. Any temperature-measuring device depends upon one or more of the so-called "primary elements" for its operation. Thermometers, bimetallic strips, electric resistance elements, thermocouples, gas and liquid-filled systems, spectral and total radiation pyrometers represent the usual group of primary elements in instruments.

The expansion of mercury in a glass tube serves quite well in the lower temperature ranges and where sufficient quantity of material and space is available. A high-temperature thermometer, based upon somewhat similar principles, is reported by the Germans (13-30, Sept. 1946). It uses gallium in a quartz tube with hydrogen gas over the liquid. Top temperature readings of 1000° C. (1830° F.) with 4 to 5° C. errors are obtained. However, at 300° C. (570° F.) the errors amount to 25 to 30° C.

The differential expansion of bimetallic strips, properly designed (13-46, Jan. 1947), provides a simple device for temperatures as high as 2000° F. They may also be used to operate switches, air valves, and other control devices. Bimetallic strips are frequently used for ambient temperature compensation in other types of equipment. The relatively large space occupied by the average bimetallic device prohibits its use where the temperatures of small objects, or spot temperatures of larger objects, are needed. Gas and liquid-filled systems have somewhat the same size limitations and are usually used at the lower temperature levels.

For precision control and measurement, the electrical resistance thermometer, with electrical equipment appropriate to the precision required, gives excellent results. For some research purposes the heating element of the furnace forms the resistance element of the measuring and control system (13-39, Dec. 1946). Accuracies of 1° F. over the range 32 to 1832° F. are reported.

In metals research and industry the most useful primary element is the thermocouple. The proper selection of thermocouples and their accessory equipment depends upon the temperature range desired and the conditions of operation—whether it is subject to corrosion, oxidation, or reduction.

Copper-constantan is commonly used at temperatures ranging from —300 to 660°F., while iron-constantan covers the range —300 to 1580° F. Chromel-alumel, in the range 480 to 2250° F., is very likely the most widely used in the heat treating and nonferrous fields (13-41, Dec. 1946). For higher temperatures (especially molten metal temperatures) the platinum-platinum rhodium thermocouples are used. Their temperature range is normally 930 to 2550° F. but they often are used as high as 3000° F.

Molten metal temperatures are an important topic, both from the standpoint of the difficulty of accurate measurement, and the necessity of securing close control (13-19, July 1946; 13-28, Sept. 1946). Higher temperature requirements in the processing of newer alloys add to the difficulty of the problem. The practice of placing a thermocouple in a protection tube and immersing it in the molten bath frequently contaminates the couple, resulting in erroneous readings, or mechanical breaking of the couple and the loss of the measurement entirely. Articles describing improvements in design of such couples (13-13, April 1946; 13-49, Jan. 1947; 13-16, May 1947; 13-26, July 1947) point toward the use of a platinum couple in a small silica tube immersed 3 or 4 in. in the molten metal. The dimensions of the silica tube are kept small to reduce the effects of thermal shock. Methods of cooling the leads to the couples and the mechanical arrangement for supporting it differ widely with the physical arrangement of the melting furnace.

Burning off of the impurities of all protection tubes and wells prior to their use is essential to long, accurate life of platinum couples (13-31, Aug. 1947). Sulphur is reported to be responsible for the transfer of silicon to the platinum wires in the form of silicides of platinum (13-13, May 1947).

Thermocouple wells and protection tubes, if properly selected and designed (13-47, Jan. 1947), will greatly increase the useful life of thermocouples. Small thermal lags between the thermocouple and the furnace load give increased accuracy and speed of response to small changes of temperature in the load itself. Hence, the protection tubes should be of good heat-conducting material, small in size, yet mechanically strong and impervious to contaminating elements (13-9, May 1947). Inconel is excellent for a wide variety of industrial applications. An excellent tabulation of recommended protecting tubes for various temperature ranges and applications (13-47, Jan. 1947) gives much practical information.

All the advantages of a good thermocouple properly protected are lost if equal care is not taken in connecting it to the recording or indicating instrument (13-7, April 1947). Thermocouples give rise to a small e.m.f. (voltage), the amount of which depends upon the material of the couple and the temperature difference between the bead of the thermocouple and that at some junction in the leads to the thermocouple. This junction is usually referred to as the reference junction and is located in the accompanying instrument. Lead wires should be of the proper materials to give voltage characteristics similar to the thermocouple used (13-12, May 1947). Well-insulated wires, carefully installed, are necessary for the correct thermocouple

*Literature references are designated by the corresponding item number in the Review of Current Metal Literature rather than by repeating the entire title, author and source; the reader can get this information by referring to *Metals Review* for the month indicated.

e.m.f.'s to reach the instrument.

Continuous measurement and recording of temperatures in the region of 2500 to 3500° F. are met with some difficulties by radiation pyrometers. In this type of instrument the radiation from the source, whether it be a solid or a liquid, is focused upon a group of small thermocouples known as a thermopile. The electrical output of this thermopile is then indicated (or recorded) on an instrument similar to the one used for a thermocouple, but with special calibration for the thermopile being used. Slag, scale and smoke cause inaccurate readings. Elevated temperatures of the measuring unit itself may seriously interfere with consistent results, and general practice is therefore to take intermittent readings.

Compressed air forced through an open-end steel tube immersed in molten metal removes slag from the path of radiation (13-26, July 1947; 13-25, July 1947). Special cooling units for the measuring assembly enable it to be used on hot slabs (13-2, Feb. 1947). Such devices in conjunction with high-speed recorders and fast thermopiles are used to check slab surface temperatures in the rolling mill (13-29, July 1947).

Temperatures at various points in the blast furnace, such as flame and checker temperatures, can also be indicated by the radiation pyrometer (13-15, May 1947). A simple one-man unit has a vacuum tube voltmeter indicator (13-14, May 1947).

Photo-electric cells are also used as radiation pickup elements for such measurements as roof temperatures of openhearth furnaces (13-23, July 1947), and charges in high-frequency induction furnaces. Accuracies of ±10° C. when calibrated for a specific use may be obtained.

Optical pyrometers, in which the brightness of a lamp filament is matched visually through an optical system with radiation from the hot object, are of several types (13-20, July 1946). Design of these instruments involves such questions as most suitable type and size of lamp filaments, types of voltage or current-measuring devices, optical systems, filters and screens. Under ideal conditions, reproducibilities of ±4° C. are obtainable, but such ideal conditions are rare, especially if true temperatures are desired. To secure reproducible heats in furnaces where the same types of materials are being melted, optical pyrometer foundry practice is quite well established. Experimental heats cause much more trouble because of varying emissivities (13-24, July 1947), slag, and smoke formation. A promising device (13-32, Sept. 1946) uses a closed silica tube with an inside diameter of ¾ in. and a ⅛-in. wall thickness, mounted on the end of a telescopic tube attached to the usual optical pyrometer. The silica tube is immersed in the molten metal to a depth of three to five times its internal diameter so that the target approaches true black body conditions. Relatively long life of the silica tubes is reported.

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Several reports of the use of photography to measure temperatures have been made (13-30, Aug. 1947; 13-6, April 1947; 13-45, Jan. 1947). Calibration was made by photographing a series of standard temperature sources on the same film. Accuracies of ±10° C. in the 1500° C. region are obtained.

Millivoltmeters and potentiometers are still the basic units for indicating and recording temperatures measured with various electrical primary elements. It is reported that the development of high-resistance, high-sensitivity millivoltmeters indicates that self-balancing potentiometer controller recorders may be somewhat overrated (13-6, Feb. 1946). However, the electronic continuous-balancing potentiometers fulfill in part the demands for more rapid response and faster multipoint recordings (11-45, Aug. 1946).

For temperature-measuring instruments of the future, ceramics with temperature coefficients as high as 6% per °C., or thinly coated metals on ceramics, are expected to give measurements and controls of the order of ±0.01° C. (13-8, May 1947).

Analysis and Identification

The spectrograph is one of the better-known instruments in the analytical field (10-44, April 1947). Fundamental concepts of the instrument and its possibilities, along with the requirements for setting up such a laboratory (10-67, May 1947), suggest that extremely careful techniques are involved.

Special techniques have been developed for the analysis of cast iron (10-102, Oct. 1946), iron and steel (10-2, Feb. 1947), and cartridge brass (10-127, Dec. 1946). The usual photographic method of recording the intensity ratio of certain spectral lines (11-40, May 1947) has been replaced by electron multiplier phototubes and applied successfully to the analysis of chromium in steel.

Microspectrography of metals (10-102, July 1947) points the way toward successful analysis of inclusions, segregations, crystalline phases, surface contaminations, metallic platings, and the extent of metallic diffusion.

The polarograph, based upon the theory of electrode polarization (10-110, Oct. 1946), has successfully reached the stage of automatic recording (10-3, Feb. 1947). The concentration of electrolyzable ions in the solution in question is related to the diffusion current and the characteristics of the dropping mercury electrode employed in the cell. Thus, direct calibration of the polarograph is possible. Comparison with samples of known concentration has been the usual method of calibration (10-113, Aug. 1947). Metallurgical applications of this instrument have received considerable attention (10-69, June 1947; 10-8, Feb. 1947). Multitip electrodes increase the cathode surface and thereby increase diffusion current and sensitivity (10-70, June 1947).

Tremendous development has taken place in type and quantity of X-ray tubes (11-5, Feb. 1946) and related photographic techniques (11-71, Aug. 1947). The effects of composition and diffraction in the making of microradiographs show distinct advantages over conventional methods for metallurgical applications (11-113, Jan. 1947). X-ray absorption of various materials, measured by X-ray photometers using phototubes, is used in a new method of nondestructive testing (11-17 and 11-18, March 1947).

The X-ray spectrometer is applicable not only to the identification of compounds but to the study of chemical reactions in the solid state (10-105, Oct. 1946). X-ray diffraction measurements have been made of the depth of cold working produced by milling (20-252, June 1947). Special methods for measurement of cold work are needed (11-91, Aug. 1947). Lattice spacing measurements at temperatures as low as —110° C. give considerable information concerning the behavior of metals used in high-altitude aviation (11-58, June 1947).

The electron microscope is primarily a means of extending one's sense of vision and should be used accordingly (11-108, Jan. 1947). The instrument is still too new to realize the possible extent of its useful applications.

Modern methods of gas analysis (10-36, April 1947) have resulted in a much greater use of instruments in this field. Chemical analyzers require some means of sampling and then removing in fixed sequence the various constituents and measuring the effect of such removal either by the constant-volume or constant-pressure method (10-26, March 1947). For furnace atmosphere control the Orsat and a dew point apparatus will give sufficient information except in rate applications (11-103, Jan. 1947). Combustion gas analyzers, dew point potentiometer recorders, flow and pressure meters give much information for gas mixing and ratio control (13-1, 13-2, and 13-3, Feb. 1946). The change in temperature of a filament, due to the change in thermal conductivity of the gas which surrounds it, forms the basis for a number of commercial instruments (10-128, Dec. 1946).

Complete "pushbutton" analysis has not been realized, but when good instrumentation is applied to a particular job the results come surprisingly close to that objective.

Metallography

From the instrumentation standpoint, the field of metallography is naturally centered around the microscope. Excellent results are obtainable with magnifications ranging from 115× to 3900× by the proper use of modern equipment (11-23, April 1947).

A system of vertical illumination successfully produces phase contrast for the study of metals (11-63, July 1947) and minerals (11-111, Jan. 1947). The migration between solid phases of a material may be observed (11-24, April 1947) by using a small amount of a substance which does not react with any of the phases present and does not interfere with their reaction.

Identification and analysis of refractories and organic materials, as well as metals, are greatly aided by use of the polarizing microscope with appropriate techniques (11-29, April 1947).

Unless specimens are properly prepared, the best of microscope equipment cannot produce good results. Polishing has long been accomplished by progressive stages of abrasion, until the desired surface is obtained. Much time and skill are required and the question of how much the structure has been altered by the process is never definitely answered (11-21, April 1947; 11-98, Dec. 1946; 11-42, July 1946).

Electrolytic polishing, in which the high spots of the sample are removed by an electric current, is a modern development. Apparatus is simple and easy to use (11-39 and 11-45, May 1947; 11-47, June 1947) and is now available commercially.

Electronics

The term "electronics", to the general public, has somewhat of a magical meaning, yet the basic industrial uses of vacuum tubes (which form the heart of the electronics field) can be quite simply classified as: *(a)* to rectify—change a.c. to d.c. current; *(b)* to turn current on or off; *(c)* to amplify—control a large current with a small current; and *(d)* to change the frequency of a current (11-14, March 1946). Each of the above uses represents a whole group of devices which are applicable to the field of instrumentation.

Industrial process measurement, in demanding faster, more accurate, and more trouble-free instruments, has brought about the application of electronics to the redesign of a number of basic instruments. The electronic potentiometer, in which the usual galvanometer is replaced with an electronic converter and amplifier, is a good example (11-15, March 1947). This device is a continuous self-balancing mechanism with greater speeds of response and more flexibility as a recording and control device.

The Geiger counter X-ray spectrometer combines the electronic potentiometer with the Geiger counter, to replace the photographic recording camera of the usual X-ray spectrometer. Radiation counting rate meters of this type are applicable to metallurgical and other research in which radioactive isotopes are used (11-76, Aug. 1947; 11-71, Nov. 1946).

Photo-electric tubes applied to instrumentation have produced tremendous improvements in counting devices, relays, photo-electric galvanometers, pyrometers, and controllers. When applied to a direct-reading spectrometer a maximum of 14 different elements found in industrial alloys can be analyzed in 40 sec. (10-152, Jan. 1947).

Timing devices are, in general, of two types—one to measure the time interval between successive events, and the other is to predetermine or control that interval. Electronic devices are useful where the time interval is very short. Control of the interval between the molding action and the ejection of the casting from a die-casting machine is but one example (14-85, April 1947).

A unique device is used for the inspection and sorting of iron samples. It consists of a 1:1 ratio a.c. amplifier used as an impedance changer to operate an a.c. voltmeter measuring the secondary voltage of a transformer. Small differences in the samples used as cores of the transformer are observed on the voltmeter (11-11, Feb. 1947).

The cathode-ray oscilloscope has been applied to magnetic testing, not only to determine core loss and permeability, but also other factors from the B-H curve. Complete B-H curves of two different materials can be quickly compared (11-98, Aug. 1947). A similar device using the transformer pickup coils and a cathode-ray oscillograph can quickly show small differences in material caused by fatigue or corrosion. Such defects may be detected long before failure occurs (12-196, Jan. 1947). Another application of the oscillograph is in studying the magnetic properties of extremely small cross sections. Samples as small as 10^{-5} sq.cm. can be used (11-95, Dec. 1946). A magnetic potentiometer is quickly adaptable to a wide variety of shapes and sizes (11-69, Nov. 1946).

The measurement of high vacuums by thermal and ionization gages depends upon stable electronic circuits for their accuracy and adaptability to control (11-86, Dec. 1946). Much improvement in the stability of electronic circuits of various types has been made in recent years—an important point when comparing modern electronic devices with those of a few years ago.

Electronic relays permit the use of minute electrical impulses or mechanical pressures to actuate various control devices. Sorting of parts is but one application (11-53, Sept. 1946).

The regulation of current to a constant value for application to such loads as resistance welding machines and resistance-type furnaces has been developed by recent applications of electronic circuits. Either voltages or currents of large magnitude can be regulated (11-114, Jan. 1947).

Microwaves may, in the near future, be applied to such industrial uses as counting, sorting, and inspection, where phototubes or contact devices are not applicable (11-67, Oct. 1946). This is, without a doubt, only the beginning of the application of modern electronics to the field of instrumentation.

Surface Measurement

The roughness or smoothness of a surface has long been subject to only a relative description, but the realization that surface finish has a very definite relation to wearing qualities has necessitated more accurate specifications. The root-mean-square height of the profile diagram above its mean line as obtained by an electric recording device gives one convenient and commonly used method. The ratio of bearing area to the total area is another closely related method. Differences between methods of definition are largely due to the differences in profile character of the surface. Scratch depth in micro-inches is a convenient way of referring to surfaces, especially those produced by grinding. Ranges of surface roughness vary from 2 to 500 millionths of an inch (r.m.s.). Adaptability of an instrument to the particular range needed is highly important (11-5, Feb. 1947).

A typical surface recording instrument employs a tracing point in contact with the surface, some means of amplifying its motion, and a device for recording the greatly enlarged profile of the surface. The Tomlinson surface recorder, designed at the National Physical Laboratory, England, uses a mechanical system to get a magnification of 100× on a smoked glass disk and an additional optical magnification of 100×, thus obtaining a 10,000× over-all image on the screen of an optical comparator (11-55, Sept. 1946). At the same laboratory the Talysurf instrument amplifies the surface irregularities electrically and provides a direct autographic chart record with amplifications ranging from 2000× to 40,000×.

Use of a Schmaltz "light-slit" adapted to a metallurgical microscope has resulted in some splendid photomicrographs of various types of surfaces (11-26, May 1946). Related optical and mechanical methods of examining surfaces are discussed (11-101, Jan. 1947).

For rapid comparison of machined surfaces, a photo-electric glossmeter was developed by the National Bureau of Standards. It operates on the principle that shininess is one indication of surface smoothness and with careful choice of applications may become an important production inspection tool (11-25, May 1946; 11-57, Sept. 1946). Relative merits of the microscope, reflection meter, and electrical profilometer, as applied to raw and plated die-cast surfaces, tend to favor the use of the profilometer. Its records are less subject to the personal judgment of the operator (11-27, April 1947.) The Bureau of Standards also uses a carefully prepared plastic replica of the surface, analyzed by photo-electric

(Turn to page 9)

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received in the Library of Battelle Memorial Institute, Columbus, Ohio, During the Past Month.

1 ORES & RAW MATERIALS
Production; Beneficiation

1-132. The Application of Xanthates to Flotation. Norman Weiss. *Mining Technology*, v. 11, Sept. 1947, T.P. 2213, 12 p.

Summarizes results of a recent survey of North American plants.

1-133. Norwegians Conquer Taconite. *Mining World*, v. 9, Oct. 1947, p. 22-26.

Methods used at Norwegian mine to reduce taconite to usable form. Milling and concentration data. Magnetic separation and sintering are important steps.

1-134. Lean Ores. W. Luyken. *Iron and Steel*, v. 20, Oct. 1947, p. 471-475.

German experience in the concentration of lean iron ores. Character of the different ores; new ore-preparation, concentration, and acid-smelting processes; magnetizing, roasting, and subsequent magnetic separation; roasting of spathic ores; and acid smelting. 10 ref.

1-135. What Needs Doing in Ore Dressing. Edmund J. Pryor. *Mining and Metallurgy*, v. 28, Oct. 1947, p. 512-515.

The need for more fundamental knowledge of what takes place in the treatment of an ore.

1-136. The Dressing of the Lesser Metallic Minerals. F. B. Michell. *Mine & Quarry Engineering*, v. 13, Oct. 1947, p. 300-306.

The dressing of ores of aluminum, antimony, bismuth, cobalt, chromium, and manganese. (To be continued.)

1-137. Experimental Basis of a Test Method and of a Method for Laboratory Preparation of Samples for Analysis. N. V. Bargshev. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 521-532. (In Russian.)

Effect of sample weight and grain size on analytical results. The work was on lead-zinc, tungsten, molybdenum, tin, and other ores. Use of the results should save considerable time which is ordinarily spent in crushing finer than necessary.

1-138. Beneficiation of Western Manganese Ores. C. H. Schack and H. G. Poole. *Bureau of Mines R. I. 4117*, Sept. 1947, 38 p.

Summarizes and correlates the information obtained during the war by the Bureau in the course of which 288 lots of ore from 135 different deposits were subjected to ore-dressing investigations. The various ores are classified as oxide, carbonate, silicate, and complex types.

1-139. Pilot Mill Concentration of Las Vegas Wash Manganese Ore, Boulder City, Nev. S. R. Zimmerley and C. H. Schack. *Bureau of Mines R. I. 4123*, Sept. 1947, 31 p.

A pilot-plant study of the process for beneficiating 28% Mn ore. The method comprises crushing and grinding to obtain a minimum of slimes, sizing the ground ore into three fractions, and flotation of the gangue. Results indicate commercial feasibility.

1-140. Recovery of Soda and Removal of Sulphate in the Lime-Soda Process for Alumina Production. Francis J. Frattali, Stanley J. Green, and Verda I. McLendon. *Bureau of Mines R. I. 4126*, Sept. 1947, 14 p.

Study of the Na_2CO_3-Na_2SO_4-NaOH-H_2O system furnished sufficient information for development of a satisfactory method for removal of sulphate introduced into the sinter by oxidation of pyrites present in the ore and by combustion of sulphur in the fuel. Phase diagrams for the system; the extraction method.

1-141. Concentration of Oxide Manganese Ore From the Ophir Hill Mine, Ophir, Tooele County, Utah. S. J. Hussey, T. F. Mitchell, and J. A. McAllister. *Bureau of Mines R. I. 4130*, Oct. 1947, 6 p.

It was found possible to recover 86% of the manganese as 35% Mn by washing and desliming minus 1-in. ore and to meet Metals Reserve Co. specifications without sintering. Tabling a small amount of original sands provided a factor of safety. Coarse crushing and gravity concentration of nodules obtained by washing and sizing produced a 48% sinter containing 80% of the manganese.

1-142. The Effect of Grain-Size Distribution on the Flotability of Sulphide Minerals. I. N. Plaskin and G. N. Khazhinskaia. *Bulletin of the Academy of Sciences of the U.S.S.R., Section of Technical Sciences*, June 1947, p. 757-765. (In Russian.)

A study of flotation in relation to grain size for a number of minerals (galena, chalcopyrite, chalcosine, and pyrite) under the influence of depressors, activators, and oxidizers. 11 ref.

1-143. Raw Materials for Iron and Steel Making. Herbert W. Graham. *Mining and Metallurgy*, v. 28, Nov. 1947, p. 538-542.

Interdependent characteristics which affect the geologist, mining engineer, metallurgist, and plant operator.

1-144. Recherches sur la Separation des Sels d'Uranium dans un Traitement de Betafite. (Investigations on the Separation of Uranium Salts in the Treatment of Betafite.) M. Bachelet. *Bulletin de la Société Chimique de France*, v. 14, July-Aug. 1947, p. 628-632.

Various methods of separating the uranium from this mineral were studied, and fusion with soda was found to give the best results. Fractional precipitation of the hydroxides may be used to obtain the uranyl salts which are transformed into nitrates and purified by dissolving in ether.

1-145. Automatic Controls Cut Milling Costs. *Engineering and Mining Journal*, v. 148, Nov. 1947, p. 138-145.

Intelligent use of modern automatic, or work-saving, devices in crushing, grinding, and flotation.

1-146. For Less Expensive Grinding. *Engineering and Mining Journal*, v. 148, Nov. 1947, p. 146-149.

Some of the more recent developments in equipment and methods.

1-147. Separation. *Engineering and Mining Journal*, v. 148, Nov. 1947, p. 150-153.

Some new developments, mainly modifications of well-known equipment, such as tables, magnetic separators, classifiers, heavy-media separators, cyclones, thickeners, cyanide mixers.

1-148. The Dressing of the Lesser Metallic Minerals. (Concluded.) F. B. Michell. *Mine & Quarry Engineering*, v. 13, Nov. 1947, p. 334-342.

Magnesium; mercury; molybdenum; nickel; tantalum; thorium; titanium; uranium; and vanadium. 28 ref.

1-149. Application of the Bird Centrifuge at Hedley Mascot Mill. C. W. S. Tremaine. *Canadian Institute of Mining and Metallurgy, Transactions* (bound with *Canadian Mining and Metallurgical Bulletin*), v. 50, Oct. 1947, p. 533-536.

Application to a gold ore in which the sulphides are oxidized in many sections and the breccia filled in with a very soft, hydrous iron silicate. This latter material slimed very badly and disrupted the entire circuit which had been operating on another type of ore in which the gold was intimately associated with arsenopyrite and pyrrhotite in highly silicified and garnetized limestone gangue. The thickeners and drum filter would not handle the new ore, but good results have been obtained with the centrifugal machine.

1-150. An Apparatus for Comparing Various Zinc Dusts for Gold and Silver Precipitation. Dwight J. A. Dahlgren. *Canadian Institute of Mining and Metallurgy Transactions* (bound with *Canadian Mining and Metallurgical Bulletin*), v. 50, Oct. 1947, p. 558-566.

In the zinc-dust precipitation of gold and silver from pregnant cyanide solutions, various zinc dusts differ in efficacy. For example, distilled zinc dust is superior to atomized zinc dust, and one variety of distilled zinc dust may be better than another. Details of apparatus for quantitative comparison of the dusts, and its operation.

1-151. Iron Powder From the Mesaba. *Industrial and Engineering Chemistry*, v. 39, Nov. 1947, p. 8A, 10A.

Principles of new plant being constructed in the Mesaba for production of high-grade iron powder from low-grade iron carbonate slate.

For additional annotations indexed in other sections, see:
10-206-209-216; **27**-238-240.

2 SMELTING AND REFINING

2-253. Use of Oxygen in the Openhearth Furnace. Parts II and III. *Blast Furnace and Steel Plant*, v. 35, Sept. 1947, p. 1091-1095; Oct. 1947, p. 1224-1226.

Description of the process, the equipment used, and the results obtained. Effects on shop operating procedures, materials charged, and equipment; and also the effect of oxygen purity on performance.

2-254. Basic Openhearth Slag Control. Parts II and III. Charles R. Funk. *Blast Furnace and Steel Plant*, v. 35, Sept. 1947, p. 1098-1104, 1136; Oct. 1947, p. 1230-1234.

The relationship between the chemical composition of basic openhearth slags and the appearance of the slag pancake sample. Slag composition vs. carbon, phosphorus, and sulphur elimination; also manganese recovery. Data for several heats. (To be continued.)

2-255. Operation of the Iron Blast Furnace at High Pressure. Part II. J. H. Slater. *Blast Furnace and Steel Plant*, v. 35, Oct. 1947, p. 1213-1218.

Condensed from paper read before General Meeting of A.I.S.I., New York, May 21-22.

2-256. Putting the Pressure on Pig. *Enamelist*, v. 24, Oct. 1947, p. 21-23.

Use of pressure blowing in blast furnace operation.

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means (11-25, April 1947; 11-66, Oct. 1946).

Where maximum roughness is in the order of 0.05 to 2 microns, the interference microscope gives a direct measurement (11-70, Nov. 1946). For the extreme opposite range of roughness, a dial-gage type of meter gives a convenient means of profiling a surface. It is especially adaptable to the measurement of surfaces of castings (11-96, Aug. 1947).

Williamson describes a series of tests on a variety of surfaces with different size tracer points, and concludes that regardless of the smoothness of the surface, a tip radius of 0.0005 in. is adequate (11-59, June 1947).

The real importance of surface finishes is apparent when detailed studies of bearings are made. Increased loads, cooler running, closer tolerances, less wear, and less power requirements result from improved surfaces (21-54, July 1947).

Thickness Measurement

When only one side of a material is accessible, the problem of determining its thickness becomes quite difficult. Various types of chemical films and metallic platings, as well as sheet and tube thicknesses, need to be measured to control uniformity and to know their absolute dimension. Corrosion and wear can often be detected as they approach safe operating limits. Magnetic gages, capacitive micrometers, supersonic devices, X-ray absorption, interferometers, chemical and electrochemical methods are the most common instruments used.

Magnetic gages in which the sample forms a part of the path for the flux linkage are usable to measure thickness of magnetic materials or coatings thereon. Applications include the determination of nickel thickness on S.A.E. 1085 steel panels (11-97, Dec. 1946) and the detection and measurement of corrosion pits in steel tubing (6-87, June 1947).

Variation of frequency in an electronic oscillator in response to minute movements of the capacitive element forms the basis of an electronic micrometer. Extremely small changes in an air gap, oil film, or similar dielectric can be measured. Applications to dilatometers, manometers, roughness gage, and hardness testing have been made (11-61, Oct. 1946).

The supersonic reflectoscope using standing wave technique on a series of test blocks ranging from 0.0109 to 0.151 in. thick resulted in accuracies within 2% (11-59, Oct. 1946). Another similar device uses a simple variable frequency oscillator and a quartz crystal (11-1, Feb. 1946).

The adaptation of X-ray absorption to rapid thickness measurements involves the use of a fluorescent-screen detector. The X-rays penetrate the material and strike the phosphor. The intensity of the resulting longer radiations is measured by photomultiplier tubes. Differences of 1% in thickness are detectable (11-41, May 1947). For coatings of 0.00001 to 0.01 cm. in thickness on crystalline material X-ray diffraction-type apparatus is used, with X-ray source and Geiger counter on the same side of the coating (11-37, July 1946).

The scheme of counting interference fringes of a known monochromatic light reflected from highly reflective surfaces enables the thickness of thin layers of evaporated metal to be measured. Such measurements have defied any other apparatus (11-112, Jan. 1947; 11-26, April 1947).

Any review of thickness measurements would be incomplete without reference to chemical methods. Stripping, as applied to the determination of the thickness of tin on tin-coated copper and brass, is a typical example (11-12, March 1947). Controlling the rate of solution of cadmium coatings in concentrated hydrochloric acid by use of a nickel salt and then observing the time-of-gassing is another (11-37, March 1947), while electrochemical determination represents still another method (11-107, Jan. 1947).

Miscellaneous Types

The supersonic flaw detector is a comparatively new device for nondestructive testing. In a method adopted by the Germans, a quartz crystal oscillator was used as a generator, but the frequency was wobbled 100 cycles to avoid standing waves either in the test material or in the instrument itself (12-197, Jan. 1947). Frequencies may be anywhere above 16,000 cycles per sec. In general, the higher the frequency the smaller the defects which can be discovered, and the lower the frequency the greater the depth of penetration into the material. By use of the proper frequency and square wave distance marker, the size and location of the defect may be estimated (11-74, Aug. 1947). Penetrations up to 24 ft. in steel and 28 ft. in aluminum have been made. Fatigue cracks in working parts of a machine may be located without dismantling the machine. Thickness measurements may also be made by interpretation of the harmonic response to the vibration (11-55, June 1947).

The subject of gloss measurements is so extensive that a complete book has been written giving definition of gloss, methods and instruments used, and indicating the direction and needs of future research (27-22, Feb. 1947).

Dilatometer methods of determining thermal critical points require fairly simple laboratory apparatus, but constant attendance is necessary to get simultaneous expansion and temperature readings and to control the heating rates. An automatic recording dilatometer eliminates the need of an attendant except for initial set-up and starting of the apparatus (11-99, Aug. 1947). A somewhat similar device is designed for the control of foundry sand (11-53, June 1947).

A unique automatic recording balance has been made by combining a standard chain-balancing analytical balance with a Leeds and Northrup self-balancing potentiometer mechanism to give a continuous record of the change in weight of any object over a long period of time. Sensitivities can be varied from 0.5 mg. per chart division to as much as is needed to have the full chart cover the change in weight to be recorded (11-106, Jan. 1947).

A study of the basic design of bellows and their application to pressure and temperature control shows a tremendous number of tasks they can perform. Valves, thermostats, pressure regulators, liquid float switches, flexible connections, and mechanical pressure control are but a few of the uses mentioned (24-134, June 1947).

The lack of any quantity of devices to record and control humidity is no doubt due to the difficulty of the task. A number of excellent approaches to the general problem have been made. Securing the dew point by alternately heating and cooling a polished surface under carefully controlled and recorded conditions is the basic method around which most present instruments are designed. That constant-humidity control is needed in industry is a conclusion with which most technical men will agree (13-24, Aug. 1946).

Liquid-flow and (perhaps more common to the metals industry) gas-flow measurements and control have developed through the integrating and indicating stage to automatic recording and controlling. Electronic rotameters are applicable to extremely small flow control (11-44, Aug. 1946).

Fundamentals of electrical indicating instruments or meters have not changed much (11-10, Feb. 1947). However, changes in details of design and construction have resulted in increased sensitivity, accuracy, and dependability. Freedom from iron particles in the component copper wire has been a big factor (23-26, March 1947). A new magnet material reduces the size as well as increases sensitivity.

The reflection goniometer known to the diamond industry is now being applied to the measurement of cutting tool edges. Clarification of the geometry involved often minimizes if not eliminates special problems (11-14, March 1947).

The radioactive integrator is probably only an isolated example of the applications of radioactive material to the present and future field of instrumentation. A thinly deposited layer of polonium, as a source of alpha particles, covers the surface whose area is to be determined. With a suitable grid between the surface and the collector plate of the detector, only those particles traveling perpendicular to the detector plate are received, thus in effect obtaining a projection of the area desired. The detector then measures the quantity of these particles and is calibrated in terms of area (11-73, Aug. 1947). In addition to area measurements, porosity measurements and integrations of curves or charts may be made. Application of this type of device is in its infancy.

2-257. Synthetic Bauxite. A. V. Hussey. *Chemistry & Industry,* Oct. 18, 1947, p. 635-638, 642-644.

A process for production of synthetic alumina, for use in aluminous cement, from the "red mud" which is a waste product from the Bayer process.

2-258. Fuel Requirements in Steelmaking. *Coke and Gas,* v. 9, Oct. 1947, p. 299-306.

Means of reducing fuel consumption. New processes of steelmaking now under investigation include the manufacture of high-quality bessemer steel by blowing with oxygen and the use of oxygen in the blast and openhearth furnaces, and completion of refining in the ladle at comparatively low temperatures and partial reduction. 12 ref.

2-259. Alloy Billet Grinder Features Oscillatory Head Movement. *Iron Age,* v. 160, Nov. 6, 1947, p. 99-100.

Lower cost, controlled metal removal, and elimination of the human element in grinding are principal features claimed for new automatic billet grinder designed particularly for stainless steel slabs, billets, and similar hot rolled products.

2-260. Oxygen for Decarburization. *Steel,* v. 121, Nov. 10, 1947, p. 126, 128, 141.

Proceedings of annual Southern Ohio Open Hearth Committee, A.I.M.E., meeting in Columbus, Ohio. A new method of charging openhearths and qualities of present-day scrap.

2-261. Electric Smelting of Low-Grade Nickel Ores. S. F. Ravitz. *Bureau of Mines R. I. 4122,* Sept. 1947, 39 p.

Investigation of three deposits in Washington and Oregon containing 1 to 2% Ni and large percentages of iron. Partial reduction results in over 90% recovery as ferronickel containing 25 to 30% Ni. Suitability for preparation of nickel alloy steels such as 18-8 stainless was proven experimentally. Ferronickel containing at least 75% Ni can be produced by oxidation of lower grade material with iron ore or Ni-Fe ore. How a low-carbon steel containing about 2% Cr can be recovered from one of the ores. Estimates of energy and reducing-agent requirements for several possible smelting procedures.

2-262. Solidification of Steel Ingots. Parts III and IV. (Concluded.) J. R. Fleche. *Iron Age,* v. 160, Nov. 6, 1947, p. 92-98; Nov. 13, 1947, p. 94-98.

A mathematical study of the derivation and utilization of K, which is a comparative measure of linear freezing speed; methods of applying K values to steels of various carbon contents. Influence of the various factors involved; mold design from the standpoint of speed of freezing and steel cleanliness.

2-263. Recent Progress in the Metallurgy of Malleable Zirconium. W. J. Kroll and others. *Electrochemical Society Preprint 92-16,* 1947, 15 p.

An improved method of producing zirconium carbide from zircon sand by use of an arc furnace; melting of zirconium metal in graphite crucibles.

2-264. Roheisenerzeugung aus Eisenarmen Moller. (Pig-Iron Production From Low-Grade Iron Ore.) George Bulle. *Stahl und Eisen,* v. 66-67, Feb. 27, 1947, p. 69-78.

Data concerning production of pig iron from low-grade ores which indicate technical feasibility for contents of iron as low as 1%. Conclusions concerning the effects of composition, type of ore additions, required further treatments, fuel consumption, furnace capacities, labor requirements, and over-all costs. German experience to date shows great progress but need for much additional research.

2-265. Die Entwicklung des Basischen Windfrischverfahrens. I. Allgemeine Betrachtung — Vanadingewinnung. II. Herstellung von Manganschlacke. (Development of the Basic Converter Method. Part I. General Considerations; Vanadium Production. Part II. Production of Manganese Slags.) Walter Bading. *Stahl und Eisen,* v. 66-67, April 24, 1947, p. 137-149; May 22, 1947, p. 180-186.

An historical review; results of investigation of vanadium-containing slags, production of V and Si slags; drum converters and rotating-tube furnaces; application of the V-slag method; recovery of V; smelting of spiegeleisen; and phosphorus spiegeleisen and pig iron. The latter were thoroughly investigated on a laboratory scale, and results compared with production data.

2-266. Sur la Préparation de l'Antimoine Métallique par Electrolyse Ignée. (Concerning the Preparation of Metallic Antimony by Fused-Salt Electrolysis.) Georges Weiss. *Bulletin de la Société Chimique de France,* v. 14, May-June 1947, p. 476-478.

Results of a study of the electrolysis of antimony oxide and antimony sulphide in fused sodium borate and sodium phosphate. Yields of antimony for different current densities were determined, as well as variations due to other factors.

2-267. Reduction and Refining. *Engineering and Mining Journal,* v. 148, Nov. 1947, p. 154-162.

Survey of modern developments of several plant procedures and equipments not previously mentioned in the literature, as well as some which have not been too widely recognized. The Dorrco fluosolid process, for roasting or reduction of ores and calcination of limestone is based on reaction of gas with solids in a turbulent suspension (similar to the fluid-catalytic-cracking process for petroleum). Other items include: new materials-handling methods; use of oxygen in roaster, furnace, converter, or fuming plant; reverse leaching of zinc; two-drum filtration; plastic spacers in electrolytic cells; vacuum dezincing and continuous refining of lead; soda treatment of lead drosses; continuous electric melting; new dust-collection methods; reverberatory-furnace improvements; continuous zinc reduction; copper-converter improvements; mercury-arc rectifiers in aluminum production; suspended igniter for improved sintering; silica-slurry hot patching of furnace refractories; double water-jacketed screw feed cooler; and electric smelting of copper.

2-268. The Mechanism of Carbon Removal in the Openhearth Furnace. A. H. Jay. *Journal of the Iron and Steel Institute,* v. 157, Oct. 1947, p. 167-172.

Critical examination of a typical acid openhearth cast shows that rates of carbon removal at the end of the ore boil and during the limestone boil are closely related only to the degrees of oxidation at these stages (as judged by the respective Si and Mn contents) rather than to the product of the C and O_2 contents. This conclusion is supported by many previous observations of steelmaking data. On this basis, a reaction mechanism is developed which is substantiated by calculations of the relative concentrations of O_2 and Fe atoms on the surface of the CO-gas bubble. These show that the bubble can accommodate 3300 Fe atoms. Based on this the over-all O_2 content of the liquid bath is 0.009%. This value is in remarkable agreement with experimental data.

2-269. Some Aspects of the Refining of High-Phosphorus Iron. W. L. Kerlie. *Journal of the Iron and Steel Institute,* v. 157, Oct. 1947, p. 173-182.

Compares the phosphorus and carbon equilibria and the factors affecting the rate of carbon removal in the refining of iron on a thermodynamic basis. On the basis of the general equations developed, two examples of the refining of high-P iron are quoted and certain conclusions are reached from an examination of the results. Factors which determine oxide requirements and processing time and some notes on the more practical aspects of refining.

2-270. An Introduction to the Interaction of Carbon and Iron Ore at Temperatures up to 1450° C. H. L. Saunders and H. J. Tress. *Journal of the Iron and Steel Institute,* v. 157, Oct. 1947, p. 215-222.

Rates of reaction between three partially reduced ores and various forms of carbon were studied over a wide range of temperatures at varying deoxidations, using a special laboratory furnace. Rates up to 10% deoxidation per min. were observed.

For additional annotations indexed in other sections, see: 15-41; 17-92.

3 PROPERTIES OF METALS AND ALLOYS

3-343. Beryllium and Beryllium Bronze (Beryllium Copper). (Continued.) Robert Gadeau. *Microtecnic,* v. 1, Aug. 1947, p. 85-89. (English section.) (For figures see French section, p. 195-204.)

Composition and general properties; effects of various thermal treatments. (To be continued.)

3-344. Metallurgical Properties of High Yield Strength Seamless Line Pipe. A. B. Wilder and J. D. Tyson. *Welding Journal,* v. 26, Oct. 1947, p. 872-880.

Results of a study of a new grade of seamless line pipe with 52,000 psi. minimum yield strength and 75,000 psi. minimum tensile strength. The steel of this pipe contains 0.40% max. carbon and 1.40% max. Mg as compared with 0.30% and 1.25%, respectively, in the steel commonly used for line pipe. Various factors relating to bend tests, various welding-rod combinations, and the influence of chemical composition of the steel on the weld properties, were investigated. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

3-345. High-Frequency Excitation of Iron Cores. J. D. Cobine, J. R. Curry, Charles J. Gallagher, and Stanley Ruthberg. *Proceedings of the I.R.E.,* v. 35, Oct. 1947, p. 1060-1067.

Several iron alloys intended for use in wide-band transformers were studied from the point of view of core loss and exciting impedance. Techniques for studying these properties using both high-frequency sine-wave and wide-band random-noise excitation. The frequency range of 0.1 to 5 megacycles was covered. Materials investigated include Hipersil, Monimax, molybdenum permalloy, and B9W4A.

3-346. Tantalum as an Engineering Material. Kenneth Rose. *Materials & Methods,* v. 26, Oct. 1947, p. 94-98.

Properties and application.

3-347. Lead Alloys for Industry. *Materials & Methods,* v. 26, Oct. 1947, p. 127.

Data concerning eight lead-base bearing alloys, nine lead-base solders, six Pb-Sb alloys; six type metals; and tellurium lead.

3-348. Service Life of Austenitic Alloy Furnace Tubes. Charles S. Pugsley, Jr. *Petroleum Refiner,* v. 26, Oct. 1947, p. 119-120.

Data on 18-8 chromium-nickel steel tubes in 1000-lb. thermal-cracking units for 16 years. As a result of experience, each tube is now removed for

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INSTRUMENTATION

Equipment for Metallurgical Process Control, With Some Notes on Modern Laboratory Devices, as Described by the Manufacturers

WHILE no spectacularly new principles in instrumentation have hit the market during the past 12 months, refinements in design and application continue to appear in equipment that contributes to ever more accurate and precise measurement and control of industrial processes and laboratory experimentation. Temperature—a matter of primary importance to the metallurgist and associated technicians—is a subject of constant study by the instrument makers, and their efforts are reflected in a long list of improvements and refinements in their products announced during the past year.

Not all metallurgists can be expected to have a thorough understanding of the intricacies of electronics, electrical circuits and balancing systems that actuate a temperature indicator or controller. A knowledge of the fundamental principles of the various types, however, is most useful, and Information Letter No. 16 just issued by the American Gas Association (R-990)* is a good starting point.

Thermocouples and Thermometers

A new, highly sensitive nickel, nickel-molybdenum thermocouple that will stay on calibration in reducing atmospheres at temperatures as high as 2100° F. has been announced by the industrial heating division of General Electric Co. (R-991). The thermocouple element, supported by ceramic insulators, is sheathed in a special alloy protection tube which is welded at the hot end to make it airtight. A gastight adapter is welded to the tube at the terminal end, and screws onto a 1-in. pipe which is welded to the steel furnace casing for a gastight connection. Thus it is not necessary to pack the thermocouple or to use a junction box. Standard chromel-alumel extension lead wire connects to the temperature-indicating instrument.

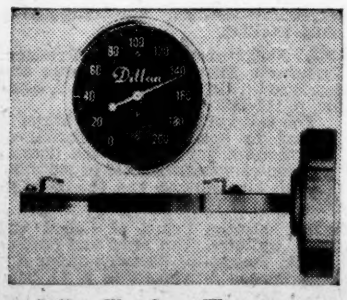
Enclosed thermocouples for general foundry use, announced by Industrial Instrument Service Co. (R-992), are constructed inexpensively in one piece in any length or shape. Longer thermocouples eliminate difficulties with burned handles and frozen set screws. These "Thermo-Tips" are supplied in 24-in., 18-in. and shorter lengths, straight or with 45 or 90° bends, using 16-gage chromel-alumel elements.

A heavy-walled thermocouple protecting tube developed by Claud S. Gordon Co. (R-993) is made of close-grained inoculated iron, cast with both ends open. One end is then closed by a special welding technique. These Gordon Serv-rite tubes have a uniform ⅜-in. wall thickness and ¾-in. inside diameter.

A pneumatic system for measurement and control of temperatures as high as 5000° Réaumur is announced by Fairchild Camera and Instrument Corp. (R-994). It is a form of gas thermometer utilizing the density of the gas being measured as a direct indication of the temperature, and is not subject to the usual radiation effects. It can be applied wherever a small quantity of the gases to be measured or controlled can be continuously sampled. Accuracies are ±1% to 2500° R., and ±2% from 2500 to 5000° R., with a response rate of ½ sec. or less.

A flat-stem dial-type thermometer for indicating temperatures of busbars and other flat surfaces is a new supplement to W. C. Dillon & Co.'s conventional round-stem type (R-995). It may be clamped onto flat or rectangular surfaces with brackets or C-clamps, or may be drilled, tapped and screwed down. It is supplied in varying widths, thicknesses and lengths of stem, in a wide range of metals and in four temperature ranges from 0 to 1000° F.

*Further information about the products described may be secured by using the Reader Service Coupon on page 21, specifying the appropriate R-number.

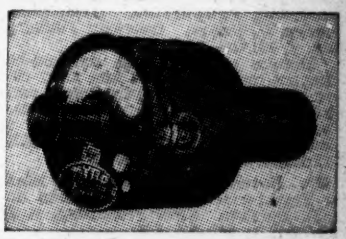


Dillon Flat-Stem Thermometer

Radiation and Optical Pyrometers

Pyrometer Instrument Co., manufacturers of self-contained optical, radiation, surface and immersion pyrometers, has announced a new radiation pyrometer with a very sensitive thermocouple (R-996). When sighted at the object being measured, an electromotive force operates a galvanometer calibrated in degrees of temperature. It is used wherever spot temperatures above 1000° F. are to be measured quickly and accurately.

Pyrometer Instrument Co.'s new bi-optical pyrometer (R-997) compares and balances the brightness of the hot body with that of a calibrated electric lamp by means of photoscreenic wedges. A second ocular dummy eyepiece can be attached to protect the other eye against glare and to steady the instrument while sighting.



Pyro Radiation Pyrometer

The new Pyro micro-optical pyrometer (R-998) is used for laboratory and scientific research work on very small objects. It gives a 20-fold magnification of the object and is furnished with a rigid support and tripod, the instrument holder being equipped with a precision worm gear arrangement for accurate adjustment in any desired direction.

A new accessory for Leeds & Northrup Co.'s optical pyrometer is an objective lens assembly which gives an image twice as large as the standard instrument provides (R-999). This increased size is particularly useful in measuring the temperature of thin or small-area objects. Typical applications are in measuring openhearth tapping temperatures by sighting at the darker streak at the center of the tapping stream, and in reading temperature during spoon tests by sighting at the narrow ribbon of metal pouring from the spoon.

Calibration of two or more optical pyrometers for accuracy can be conveniently done by use of the sinter meter, originally developed by Harry W. Dietert Co. (R-1000) for determining the refractoriness of molding materials. In the sinter meter a platinum ribbon can be held at any desired temperature up to 3000° F. The instrument is designed so that an optical pyrometer is held in position while readings are taken. A master pyrometer is used to determine ribbon temperature, and the working pyrometers are then used to take check readings. Constant temperature in the sinter meter is assured by a voltage control transformer.

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sandblasting, inspection, and reconditioning, and is replaced after 60,000 service hours. Careful and frequent inspections and strict adherence to a maximum tube-metal temperature of 1200° F. have practically eliminated tube failures in service. (Presented at Conference on Petroleum Mechanical Engineering, A.S.M.E., Houston, Tex., Oct. 1947.)

3-349. The Physics of Sheet Steel. (Continued.) G. C. Richer. *Sheet Metal Industries*, v. 24, Oct. 1947, p. 1990-1992.

Under "initial magnetization" are discussed the lattice mechanism of "nibbling growth" and elementary theory. (To be continued.)

3-350. Wrought Aluminum Alloys—Their Properties, Heat Treatment, and General Characteristics. H. S. Spaulding. *Wire and Wire Products*, v. 22, Oct. 1947, p. 772-773, 776-778.

Presented at Wire Association Convention, Chicago, Oct. 1947.

3-351. Cast Steels; Recent Developments Concerning Properties. (Concluded.) Charles W. Briggs. *American Foundryman*, v. 12, Oct. 1947, p. 44-50.

Results of static and notched-bar impact tests on carbon and alloy cast steels. Effects of heat treatment variations and impact resistance of cast vs. wrought steels. (Presented at Semi-Annual Meeting of A.S.M.E., Chicago, June 16-19, 1947.)

3-352. Developments in Magnetic Steels for Transformers. C. C. Horstman and C. H. Bartlett. *Steel Processing*, v. 33, Oct. 1947, p. 603-605, 644.

Comparative properties of old and new magnetic alloys.

3-353. Machinability of a Standard Machine Steel. John Erb and E. J. Weller. *Steel Processing*, v. 33, Oct. 1947, p. 622-623.

Table and photomicrographs show machinability and structure, respectively, of steel containing 0.18% C, 0.40% Mn, 0.40% P, 0.050% S, and 0.25% Si, as received, and after five different representative commercial heat treating procedures.

3-354. The Vital Component—Good Castings. C. E. Herington. *Western Machinery and Steel World*, v. 38, Oct. 1947. p. 80-85.

Mechanical properties, applications, and advantages of Meehanite cast irons. Effects of different heat treatments.

3-355. The Metallurgical Aspects of Gas Turbine Wheels and Nozzles. E. M. Phillips. *Society of Automotive Engineers Preprint*, Oct. 1947, 12 p.

History of the development of satisfactory alloys. Tables and charts show comparative properties and photomicrographs show satisfactory structures.

3-356. The Total Emissivity of Various Materials at 100 to 500° C. B. T. Barnes, W. E. Forsythe, and E. Q. Adams. *Journal of the Optical Society of America*, v. 37, Oct. 1947, p. 804-807.

Total emissivities were measured for various metal, carbon, paint-coated, and glass samples. Equipment and techniques.

3-357. Thermal Hardening of Cadmium Crystals. C. L. Smith. *Nature*, v. 160, Oct. 4, 1947, p. 466-467.

The phenomenon of thermal hardening was first observed by Orowan, in single crystals of chemically pure zinc. Sometimes zinc crystals, after 24 to 48 hr. at room temperature, showed no plastic deformation with applied stresses as much as 30% above previously determined critical yield stresses. The crystal might remain for several minutes without yielding. Extension would suddenly occur, and the yield stress would fall to the value originally observed. Outlines work which shows that the phenomenon occurs invariably in single crystals of spectroscopically pure cadmium. Effects of time of annealing, crystal orientation, and prestraining.

3-358. Nickel-Bearing Copper. *Metal Industry*, v. 71, Oct. 10, 1947, p. 301.

Physical and mechanical properties of new high-conductivity temper-hardened alloy.

3-359. Requirements for Die-Casting Alloys. A. W. Sundwick. *American Machinist*, v. 91, Oct. 23, 1947, p. 143.

General information on zinc-base die-casting alloys, and effects of aluminum, copper, magnesium, iron, lead, cadmium, and tin.

3-360. Freezing Points of Cobalt and Nickel and a New Determination of Planck's Constant C. M. S. Van Dusen and A. I. Dahl. *Science*, v. 106, Oct. 31, 1947, p. 428-429.

Equipment and results obtained at National Bureau of Standards.

3-361. Observations on the Failure of 80 Nickel, 20 Chromium Alloy at Excessive Temperatures. H. D. Holler. *Electrochemical Society Preprint 92-7*, 1947, 7 p.

Decrease in cold electrical resistance of a wire heating element of the above alloy was accompanied by a loss of chromium. There was little change in the resistance measured hot. Suggests measurement of the cold resistance of a heating element to indicate whether wire temperatures are excessive.

3-362. Repeated-Load Tests on Metals in the Plastic Zone. I. M. Poitman and Ia. B. Fridman. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 452-463. (In Russian.)

Apparatus and results of experiments on Armco iron, copper, high-strength steels, and aluminum alloys.

3-363. Correlation Between Impact Resistance and Cross-Sectional Reduction. Sh. S. Manevich. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 479-481; discussion, p. 481. (In Russian.)

As a result of a statistical treatment of data for 3000 specimens of high-alloy structural steel, a mathematical and graphical relationship is developed. Such relationship holds only for high-strength steels.

3-364. Some Facts About the Influence of the State of the Surface on the Cold Brittleness of Steel. E. M. Shevandin. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 596-600. (In Russian.)

Experiments on two steels (0.20% C and 0.25% P; 0.1% C). The theory proposed for the mechanism of transition to the brittle state satisfactorily explains the experimental facts.

3-365. Characteristics of Silver and Copper for Use as Electrical Contacts. B. W. Jones and L. L. Zickrick. *Product Engineering*, v. 18, Nov. 1947, p. 104-107.

Significant electrical and metallurgical properties. Effects of sulphide and oxide films, current-resistance relationships, welding characteristics, arcing properties, effect of heavy current on surface structure, and solder on contact tip.

3-366. The Annealability of White Iron in the Manufacture of Malleable Iron. S. W. Palmer. *Foundry Trade Journal*, v. 83, Oct. 2, 1947, p. 87-94; Oct. 9, 1947, p. 107-113; Oct. 16, 1947, p. 129-135; discussion, p. 135-138.

Chemical compositions and mechanical properties of a large number of test bars are tabulated and photomicrographs illustrate structures of samples containing different percentages of manganese and sulphur. Development of an annealability test. (Presented at Nottingham Conference of Institute of British Foundrymen.)

3-367. The Variation of the Reflectivity of Nickel With Temperature. Robert Weil. *Proceedings of the Physical Society*, v. 59, Sept. 1, 1947, p. 781-791.

A new method for measurement of the reflectivity of metals in the visible part of the spectrum. The multiple-reflection arrangement is applied to an investigation of the reflectivity of nickel at different temperatures. A novel way of polishing mirrors; construction of a vacuum furnace; experimental technique. 15 ref.

3-368. Rhodium. L. B. Hunt. *Metal Industry*, v. 71, Oct. 24, 1947, p. 339-342.

Engineering properties and uses.

3-369. Adsorption of Gases on Surfaces of Powders and Metal Foils. R. T. Davis, Jr., T. W. DeWitt, and P. H. Emmett. *Journal of Physical & Colloid Chemistry*, v. 51, Nov. 1947, p. 1232-1248.

The adsorptions of nitrogen, krypton, n-butane, 1-butene, and Freon-21 were measured on silver foil, monel ribbon, and a variety of powdered materials. Areas of the materials were calculated from the data by use of the B.E.T. equation. It was found necessary to apply suitable corrections to the surface-area values calculated using the various gases.

3-370. Les Propriétés Dynamiques, les Capacités d'Endurance et la Qualification des Aciers Pour Pièces de Fatigue des Moteurs. (Dynamic Properties, Fatigue Strength, and Qualification of Steels for Moving Engine Parts.) Part I. Alexandre Fotiadi. *Revue de Métallurgie*, v. 44, Jan-Feb. 1947, p. 12-39.

Results of extensive tests on aircraft-engine parts to determine causes of fatigue and methods for eliminating it. Dynamic properties of steels. Tensile and bend tests. Conditions of actual use are simulated.

3-371. Influence de Très Petites Quantités de Soufre et d'Inclusions Oxydées sur la Qualité des Aciers. (Influence of Very Small Quantites of Sulphur and Oxide Inclusions on the Quality of Steels.) L. Colombier. *Revue de Métallurgie*, v. 44, Jan-Feb. 1947, p. 47-57.

Results of experiments indicate that improvement of steel quality may be obtained by desulphurization, even when the sulphur content is only 0.005% or less. However, the effect depends more on the number and size of the sulphide inclusions than on the percentage composition. The nature of oxide inclusions also has an effect upon the classification of steels according to different properties. Many unexplained variations in steel quality may be caused by minute quantities of various elements present.

3-372. Ueber das Kriechverhalten Einiger Aluminium- und Magnesiumlegierungen Bei Temperaturen Zwischen 90 und 180°. (Creep Behavior of Some Aluminum and Magnesium Alloys in the Temperature Range From 90 to 180°.) Franz Bollenrath and Hanns Grober. *Metallforschung*, v. 2, April 1947, p. 104-111.

Al-Cu-Mg alloys having high plasticity, also other Al-Mn alloys, were creep tested for 300 hours. Resulting data.

3-373. Ueber den Zusammenhang der Härte Einer Bearbeiteten Metalloberfläche mit der Durch Die Bearbeitung Entstandenen Strukturänderung. (The Relationship Between the Hardness of a Machined Metal Surface and the Structural Changes Caused by Machining.) Karl Heinz Leise. *Metallforschung*, v. 2, April 1947, p. 111-114.

Relationships were established for different depths of machined monocrystalline surfaces. Hardening due to cold working.

3-374. Selbstentzuendliche Legierungen. (Pyrophoric Alloys.) Ernest Raub and Max Engel. *Metallforschung*, v. 2, April 1947, p. 115-119.

The self-ignition of Ag-Th alloys is caused by spontaneous oxidation of the thorium, preceded by the decomposition of water. Effects of sintering on this phenomenon and the effect of additions of other metals.

3-375. Freezing Points of Cobalt and Nickel. Milton S. VanDusen and Andrew I. Dahl. *Journal of Research of the National Bureau of Standards*, v. 39, Sept. 1947, p. 291-295.

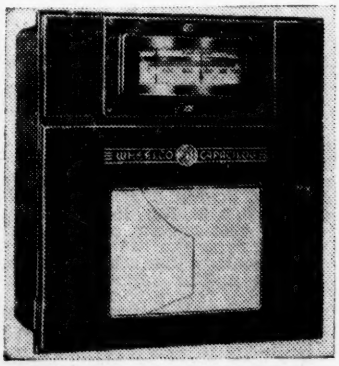
(Turn to page 14)

Recorders and Controllers

Improvements in Bristol Co.'s recording thermometers and recording gages known as the Series 500 line (R-1001) have taken the form of a modern case and certain design changes aiming toward greater simplicity of use and more convenient service. The case is designed so it can be mounted either on a wall, front of panel, or flush on a panel and can be easily converted at any time from one type of mounting to another.

Pen arms are pivoted on stainless steel journals with the pen-arm shaft supported at both ends in a rigid one-piece mounting. The journals are ground and polished to provide low-friction action. Link members between the measuring element and pen-arm mechanism are readily removable and can be equipped with over-range and under-range two-way springs when required. Improvements have been made in the measuring element to improve its accuracy and ease of adjustment.

Wheelco Instruments Co. has added to its line of indicating instruments a



The Wheelco Capacilog

strip chart recorder known as the Capacilog (R-1002). In this instrument a power-driven pen is linked with the deflection-type indicator to provide a magnified record. The scriber operates from a central motor, driving through simple gears to move a pen along a stainless steel spiral shaft. A vertical shaft is connected from the measuring system to the scriber assembly and a frictionless flexible coupling eliminates lost motion.

Wheelco's Capacitrol is also designed with a new "panelmount" (R-1003) that occupies 50% less space than the conventional Wheelco controller.

The Capacitrol can also be combined with Claud S. Gordon Co.'s new Xactline (R-1004), an anticipating instrument for overcoming thermal lag in the thermocouple and mechanical lag in the pyrometer. The Xactline, which was described in detail in the May 1947 issue of *Metals Review*, holds temperature tolerances as close as ½° F., and power on-off cycles as short as 3 sec.

A giant indicating scale for long-distance reading is an optional feature of the new design of Foxboro's Dynalog electronic recorders (R-1005). These instruments are available with ranges between −200 and +2800° F. for use either with thermocouples or electric resistance bulbs. A new indicator with concentric dial is also offered. A selector switch is provided when multiple measuring circuits are to be connected to one indicator or recorder.

Brown Electr-o-Vane Controller

Bailey Meter Co. (R-1006) is also making an electronic potentiometer pyrometer that has no moving or vibrating parts in its measuring circuit. This instrument operates from a thermocouple or from any source of d.c. potential which varies through at least 10 millivolts for full-scale range. The d.c. potential is balanced against a conventional potentiometer circuit employing the usual battery source of d.c. voltage and a standard cell. Instead of a galvanometer or millivoltmeter the Bailey Pyrotron potentiometer circuit employs a d.c. to a.c. converter and an electronic detector to measure potentiometer unbalance.

A controller applicable to pressure and other process variables as well as temperature is the new Electr-o-Vane controller introduced by Brown Instrument Co. (R-1007). This instrument operates on the principle that when a metal vane is interposed between two oscillator coils, the state of oscillation can be made to change or stop in an electronic circuit. This change or stopping of oscillation causes the electronic circuit to operate a load relay.

Brown's indicating ElectroniK continuous balance controller for temperature, pressure and other variables (R-1008) has a new rotating scale and stationary index. The large, easily read scale, plus the fact that the control index is vertical when the variable is at the control point, serves as a handy check for operators.

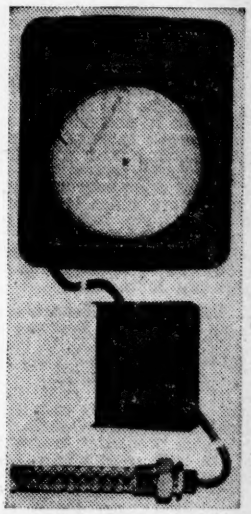
Where a large number of thermocouple temperatures must be logged in a short time, Leeds & Northrup Co. has developed a new Speedomax high-speed indicator (R-1009). A single instrument can easily handle more than 100 thermocouples. To read the desired temperature, the operator merely flips a key switch that spins the drum scale to the correct temperature.

A safety device developed by Illinois Testing Laboratories for use with its Alnor pyrometers is known as thermocouple break protection (R-1010). This automatically shuts off the furnace should the thermocouple wire break.

For temperature control in electric furnaces and melting pots, Thermo Electric Mfg. Co. has a new stepless input controller and temperature indicator (R-1011). Incorporated in the unit is a sensitive thermostatic switch controlled by a knob on the instrument panel. The control knob can be set to regulate the current input into the heating equipment anywhere from 5 to 100% time "on". It automatically compensates for changes in line voltage and will maintain a constant watt-hour input and even temperature, regardless of wide voltage fluctuations.

Dew Point Apparatus

Dew point recorders and controllers are the newest additions to the Foxboro line of instruments (R-1012). These devices require no refrigeration, water supply or air circulating system and have no mirrors to be kept clean.



Foxboro Dew Point Recorder

The unique feature is the patented moisture-sensitive measuring element, the Dewcel, which is a perforated metal cylinder about the size of a two-cell flashlight. Within is the thermal bulb, wrapped with a saline-saturated woven glass tape and two windings of silver wire to conduct the heating current.

For every water vapor pressure in contact with a saturated salt solution there is an equilibrium temperature at which the solution neither absorbs nor gives up moisture to the atmosphere. The function of the variable heat supply is to bring the Dewcel to this equilibrium temperature. The recording instrument translates the equilibrium temperature to degrees of dew point temperature.

The Alnor Dewpointer (R-1013), built by Illinois Testing Laboratories, also eliminates the need for external coolants, and is so arranged that the dew or fog is observed suspended in air and not on a polished surface. The gas sample is held in an enclosed observation chamber, at a pressure above atmosphere produced by a small hand pump. A pressure ratio gage indicates

Values determined for the freezing points and a value for Planck's constant C_2 calculated on the basis of observed ratios of brightness of black bodies at the freezing points of nickel and gold, cobalt and gold, and palladium and gold, and values of the freezing temperatures of these metals on the thermodynamic scale. More detail than article in Oct. 31, 1947, issue of *Science*. 13 ref.

3-376. Creep and Fatigue as Affected by Grain Boundaries. Charles Crussard. *Metal Treatment*, v. 14, Autumn 1947, p. 149-160.

Work on the role of grain boundaries in creep and fatigue with particular reference to the hexagonal metals, zinc and magnesium. 18 ref. (Presented at meeting of La Société Francaise de Métallurgie.)

3-377. Brittle Fracture in Mild-Steel Plates. W. Barr and Constance F. Tipper. *Journal of the Iron and Steel Institute*, v. 157, Oct. 1947, p. 223-238.

The temperature range of transition from tough to brittle fracture of mild-steel plates of different C and Mn contents was determined by means of notched-bar impact, notched-bend, and notched tensile tests. Results obtained were in good agreement, except that for very soft steels the notched tensile test gave a lower transition range than the other two tests. It was found that the range is raised by an increase in the ferritic grain size, by an increase in plate thickness, and by slow cooling after normalizing. It was also found that a high notched-bar impact value may be accompanied by a fracture which is mainly cleavage. Results also indicate that effects of plate thickness and slow rates of cooling in raising the transition range are reduced in mild-steel plates with higher Mn contents.

3-378. Effect of the Manganese Carbon Ratio on the Brittle Fracture of Mild Steel. W. Barr and A. J. K. Honeyman. *Journal of the Iron and Steel Institute*, v. 157, Oct. 1947, p. 239-242.

A series of four mild steels was tested in which the only significant variable was the Mn-C ratio. Notched-bar impact properties in the annealed and in the normalized conditions were determined. It was found that increasing the ratio lowers the range of transition from tough to brittle fracture, increases the impact values at all temperatures, and tends to result in finer McQuaid-Ehn and ferritic grain sizes. Recommends a ratio of not less than 3.0 for structural shipbuilding steels.

3-379. The Physics of Sheet Steel. (Continued.) G. C. Richer. *Sheet Metal Industries*, v. 24, Nov. 1947, p. 2194-2198, 2206.

Discussion of magnetization under the following headings: deficiencies in elementary theory; magneto-elastic modulus; susceptibility constant; idealized relationships; fundamental aspects; theory vs. practice; and the problem of measurement. (To be continued.)

For additional annotations indexed in other sections, see:
4-178-179; **6**-275; **8**-166-167; **9**-160; **19**-387; **22**-621.

4 STRUCTURE — Metallography & Constitution

4-175. The Structure of Sintered Hard Metals; Particularly Tungsten Carbide-Titanium Carbide-Cobalt Alloys. R. Kieffer. *Powder Metallurgy Bulletin*, v. 2, Oct. 1947, p. 104-111.

A new metallographic method for the investigation of cemented carbides. The procedure essentially consists in first producing recrystallization, thus causing pronounced grain growth of the carbide phase, and then applying a special selective-etching treatment which permits identification of the different carbide phases. Metallographic results confirm and supplement X-ray diffraction data on the mutual solid solubility of carbide systems. (Translated from *Zeitschrift für Metallkunde*, no. 9, 1944.)

4-176. Crystalline Aggregation of Cobalt Powder. J. T. McCartney and R. B. Anderson. *Journal of Applied Physics*, v. 18, Oct. 1947, p. 902-903

In electron microscopic studies of Fischer-Tropsch catalysts, an interesting phenomenon was observed in cobalt metal powder reduced from cobaltous oxide. The oxide particles sintered into larger smooth droplets of cobalt that were aggregated into thin hexagonal-shaped platelets. X-ray diffraction analysis showed the presence of the hexagonal crystal phase of cobalt.

4-177. Manganese Bronze; Conditions Influencing Segregation. George E. Dalbey. *American Foundryman*, v. 12, Oct. 1947, p. 35-39; discussion, p. 39-42.

Under some conditions, manganese bronze melts were found to contain a sludge consisting of iron, silicon, aluminum, and manganese. Formation of the sludge is shown to be associated with silicon contents in excess of 0.1%. There is a tendency for elongation to decrease as silicon increases. The sludge will cause misruns in thin-walled castings. Discussion by George P. Halliwell who believes that segregation of hard spots in manganese bronze is not characteristic of that alloy, but is the result of faulty metallurgical practice. (Presented at 51st Annual Meeting, American Foundrymen's Association, Detroit, April 28-May 1, 1947.)

4-178. Hydrogen Embrittlement of Steel. Part I. *Metal Industry*, v. 71, Oct. 3, 1947, p. 288.

Reviews 1940 papers by C. A. Zapffe and C. E. Sims of Battelle Memorial Institute.

4-179. Hydrogen Embrittlement of Steel. Part II. *Metal Industry*, v. 71, Oct. 17, 1947, p. 325, 329.

Concludes discussion of recent work, principally by Zapffe and Sims. Occlusion of hydrogen; high-pressure tests; restoration of ductility. 3 ref.

4-180. Kinetics of the Solution of Nitrogen in Molten Iron and in Its Alloys With Silicon. M. M. Karnaukhov. *Bulletin of the Academy of Sciences of the U.S.S.R., Section of Technical Sciences*, June 1947, p. 735-747. (In Russian.)

Laboratory setup by which the speed of absorption and ultimate solubility of gases in molten metals can be measured with considerable accuracy. Such measurements made for the above resulted in a direct relationship between solubility and the square root of the pressure. Presence of SiN in Si-Fe alloys is demonstrated. 14 ref.

4-181. Investigation of Carbides in High-Alloy Toolsteels. V. I. Arkharov, I. S. Kvater, and S. T. Kiselev. *Bulletin of the Academy of Sciences of the U.S.S.R., Section of Technical Sciences*, June 1947, p. 749-756. (In Russian.)

A method of studying these carbides by electrolytic removal of the uncombined iron in forged, annealed specimens of varying composition. The residue was chemically analyzed, and lattice parameters were measured by the Debye method for the carbides present (Fe_3W_3C, VC, $Cr_{23}C_6$, and W_2C). The formation and characteristics of these carbides.

4-182. The Influence of Manganese on Polymorphic Transition in Alloys of Iron With Chromium. A. T. Grigor'ev and D. L. Kudriavtsev. *Bulletin of Academy of Sciences of the U.S.S.R., Section of Chemical Sciences*, July-Aug. 1947, p. 321-336. (In Russian.)

Two cross sections of the Fe-Cr-Mn ternary system with constant Mn contents of 0.6 and 1.4% and with different Cr contents up to 22% were studied by dilatometric analysis, hardness testing, and determination of specific electroconductivities and microstructures. The alpha-gamma and reverse transitions and the areas of these phases are revealed by the experimental work. 20 ref.

4-183. Classification of the Solubilities of the Elements in Iron. Part II. Continuous Solid Solutions of Iron. I. I. Kornilov. *Bulletin of Academy of Sciences of the U.S.S.R., Section of Chemical Sciences*, July-Aug. 1947, p. 337-344; discussion, p. 344-346. (In Russian.)

Continuous solid solutions of iron are classified on the basis of the relationships between atomic diameters. Possibility of the formation of ternary and more complex iron solutions, having crystal lattices of the same type and differences in atomic diameters of not more than 8%. Solid solutions of the ferrite class, and more complex than the ternary, cannot exist; how to calculate the number of ternary or more complex solutions of the austenite class. 20 ref.

4-184. The Shape of Heat-Capacity and Equilibrium Cooling Curves in the Region of Melting of Solid Solutions. Karol J. Mysels. *Journal of Physical & Colloid Chemistry*, v. 51, Nov. 1947, p. 1361-1369.

The heat-capacity and equilibrium cooling curve of a two-component system forming a solid solution. Its shape in the melting region is calculated completely from properties of the system measurable outside of this region. Conditions for the absence of a discontinuity or change of slope at the solid and liquid boundary; simplified idealized cases.

4-185. The Structure of Al-Zn Alloys and Structural Analogies in Other Alloy Systems. D. A. Petrov and T. A. Badaeva. *Journal of Physical Chemistry (U.S.S.R.)*, v. 21, July 1947, p. 785-797. (In Russian.)

Results appear to disprove the formation of an intermediate phase at 443° C. and indicate that the observed thermal effects are due to a continuous change from a "disordered" solid solution to an "ordered" structure as the concentration is changed. It is believed that similar transitions take place in other alloy systems, such as Fe-Si, Au-Mn, and Tl-Bi. 18 ref.

4-186. X-Ray Investigation of Gold-Cadmium Alloys Rich in Gold. Anders Bystrom and Karl Erik Almin. *Acta Chemica Scandinavica*, v. 1, 1947, p. 76-89. (In English.) 11 ref.

4-187. Transformation in Eutectoid Alloys of Copper-Tin. Part VI. Structure and Orientation of the β-Phase. I. V. Isaichev. *Journal of Technical Physics (U.S.S.R.)*, v. 17, July 1947, p. 829-834. (In Russian.)

Results of a study using the method of X-ray polar projection.

4-188. Orientation of Cementite in Annealed Carbon Steel. I. V. Isaichev. *Journal of Technical Physics (U.S.S.R.)*, v. 17, July 1947, p. 835-838. (In Russian.)

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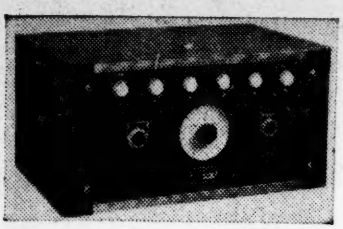


Surface Combustion Automatic Atmosphere Selector

relation between pressure of the gas sample and atmospheric pressure. Temperature is indicated by a mercury thermometer. Depressing the operating valve produces a visible condensation that is easily seen through a lens system provided with a beam of light. The procedure is repeated to find the vanishing point of the fog.

A simple and inexpensive dew point device (less than $20) for use at approximately atmospheric pressure has been announced by Pittsburgh Lectrodryer Corp. (R-1014). A small sample of gas to be tested is passed through an outer container that has a glass window. At the same time a mixture of crushed dry ice and acetone is stirred with a thermometer in an inner container. At the first indication of moisture on the polished surface of the inner container the temperature is read from the thermometer.

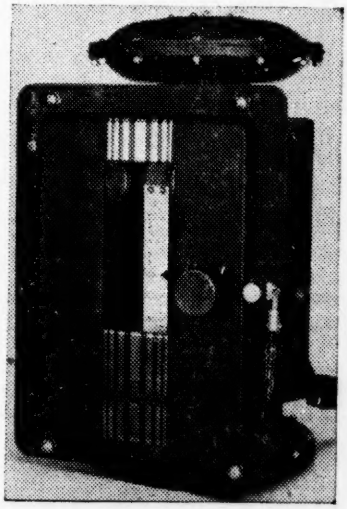
Several improvements have been incorporated in the 1947 model of Surface Combustion Corp.'s completely automatic dew point recorder first introduced in 1945 (R-1015). The recorder automatically purges itself, samples, determines and records the dew point of a gas at intervals of approximately 3 min., thus producing a point-by-point record which appears as a continuous line on a circular chart. While the basic principle is the same as that of the laboratory dew point cup, the instrument constitutes an 11-tube electronic amplifying circuit, complete Freon-12 refrigeration unit, and electric cycle timing unit.

The versatility of the recorder has been further increased by the recent introduction of an automatic atmosphere selector (R-1016), which makes it possible for a single dew point recorder to record periodically the dew points of atmospheres from as many as six sources. With six furnace atmosphere generators, for instance, connected to the manifold, automatic readings may be obtained from each line at intervals ranging from 15 min. to several hours. The desired interval is established by setting a timing dial, and a manual skipping button is also provided for an immediate reading of any given atmosphere.

Gas Analyzers

Micromax oxygen recording equipment for flue gas analysis (R-1017), developed by Leeds & Northrup Co., will handle many applications which are beyond the scope of CO_2 recorders. This equipment is used as a guide to regulating excess air in openhearth furnaces. Operating on the heat conductivity principle, the recorder analyzes for oxygen by the sensitive and accurate hydrogen difference method. Hydrogen is added to the gas sample, oxygen removed by combustion, and the conductivity of the sample before and after oxygen is removed is compared electrically.

For determination of low concentrations of carbon monoxide, such as in openhearth and other industrial operations, Mine Safety Appliances Co. has developed a new colorimetric carbon monoxide tester (R-1018). The nucleus of the instrument is a detector tube containing a yellow silica gel. A sample of the air to be analyzed is drawn through the tube, and if it contains carbon monoxide, the yellow chemical turns varying shades of green, directly proportional to the CO concentration; degree of discoloration is compared to a revolving color scale.

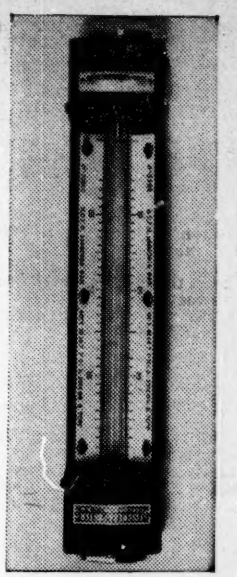


L. & N. Air-Fuel Ratio Controller

Among new safety devices recently introduced by Davis Emergency Equipment Co. is a supersensitive Vapotester, Model 6 (R-1019), for warning of the presence of combustible or explosive concentrations of flammable gases or vapors, and a Micro-Gas Analyzer for toxic ranges, which works on the principle of electrical conductivity of solutions (R-1020).

Fuel Control—Flow Meters

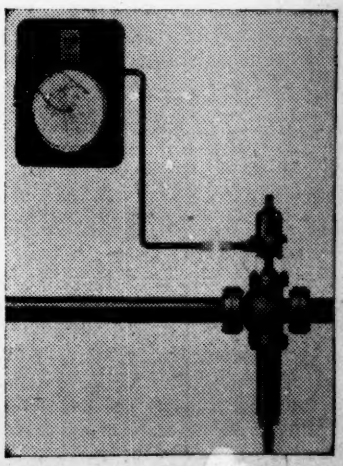
Leeds & Northrup's new air-fuel ratio controller (R-1021) operates in conjunction with Micromax pyrometers and furnace pressure controllers, and, like these instruments, employs electric-motored valve drives. As fuel flow changes, the instrument maintains air-fuel ratio constant. Or, if desired, it can provide automatic variation of ratio. The ratio can be adjusted manually for fuels of various B.t.u. content.



F. & P. Furnace Flow Guide

For continuous and accurate gas and air flow rate measurement, Fischer & Porter Co. has made several improvements in its Furnace Flow Guide (R-1022), particularly adapted to maintaining proper furnace conditions for hardening and annealing. In this device a float moves up and down within a tapered transparent metering tube, its position accurately indicating the true flow rate. The metering tube is made of noncorrosive borosilicate glass, and the F & P Glo-Tech precision boring process insures high internal accuracy.

For oil-fired heat treating furnaces Bailey Meter Co. has a new electronically operated area meter for measuring flow of fuel oil (R-1023). A specially designed telemetering transmitter is installed in the pipe line, much like a valve, and connected to a standard Bailey electronic receiver. The



Bailey Electronic Area Meter

Results of a study using the X-ray polar projection method.

4-189. X-Ray Analysis in the Steel Industry. *Journal of Scientific Instruments*, v. 24, Oct. 1947, p. 266-273.

Proceedings of a meeting of the X-Ray Analysis Group of the Institute of Physics—Sheffield, Nov. 8-9, 1946. Subjects were: Intensity relations of Debye-Scherrer powder diffraction lines, by A. J. Bradley. Application of X-rays to the study of internal stresses and deformation in metals, by W. A. Wood. An X-ray diffraction investigation of electrodeposited chromium, by H. J. Goldschmidt. Some successes and failures in the application of X-rays to industrial problems, by A. H. Jay. The surface structure of metals, by G. I. Finch. Includes discussion. 26 ref.

4-190. Ueber Die Systeme Cer-Nickel, Lanthan-Nickel, Praseodym-Nickel und Cer-Kobalt. (The Cerium-Nickel, Lanthanum-Nickel, Praseodymium-Nickel, and Cerium-Cobalt Systems.) Rudolf Vogel. *Metallforschung*, v. 2, April 1947, p. 97-103.

Experimentally obtained equilibrium diagrams for the above systems. The lattice constants of $LaNi_2$ and $PrNi_2$ were determined.

4-191. Die Löslichkeit des Kadmiums in Festem Kupfer. (The Solubility of Cadmium in Solid Copper.) Ernst Raub. *Metallforschung*, v. 2, April 1947, p. 119-120.

The saturation curve of the alpha base of the Cu-Cd system follows a reverse course. The highest solubility is at 650°, about 100° above the eutectic point. Below the eutectic temperature, the solubility of Cd in Cu follows the course outlined by Owen and Pickup.

4-192. Das System Aluminium-Indium. (Aluminum-Indium System.) Siegfried Valentiner and Irmgard Puzicha. *Metallforschung*, v. 2, April 1947, p. 127-128.

In the liquid phase aluminum and indium form a marked miscibility gap from 3.5 to 90 atomic per cent of indium (13 to 98% by weight). The solubility of indium in aluminum and vice versa is very slight in the solid phase.

4-193. Recherches Quantitatives sur les Deplacements et les Déformations de Particules au Sein d'un Métal Laminé. (Quantitative Investigations of Displacements and Deformations of Internal Particles in Laminated Metal.) Raymond Jacquesson and Pierre Brousse. *Métaux et Corrosion*, v. 22, June 1947, p. 91-99.

Results of investigation of the above phenomena, for example under alternating torsion stress. On the basis of the hypothesis proposed for the internal microstructure of laminated metals, theoretical values of deformation and displacement are given which correspond quite closely with experimental data.

4-194. The Breadths of X-Ray Diffraction Lines From Martensite. J. A. Wheeler and M. A. Jaswon. *Journal of the Iron and Steel Institute*, v. 157, Oct. 1947, p. 161-166.

Results of a study of the variation with Bragg angle of the above line breadths using the Jones method of correction for instrumental broadening indicate that the line broadening is due to balanced internal stresses rather than to small particles. 12 ref.

4-195. Hydrogen Embrittlement of Steel. Part III. *Metal Industry*, v. 71, Oct. 31, 1947, p. 366.

Discussion of the literature on this problem.

For additional annotations indexed in other sections, see:
3-349-353-357-373-376; 11-192; 27-249.

5 POWDER METALLURGY

5-72. Powdered Metal Filters. H. Seymour. *Mining Magazine*, v. 77, Oct. 1947, p. 206-208.

Porous filters of bronze and stainless steel are available commercially in various shapes. They are made from powdered metal by a sintering process. Possible uses.

5-73. The Sintering of Tungsten Carbide With Cobalt Binder. E. C. Mantle. *Metal Treatment*, v. 14, Autumn 1947, p. 141-148.

Sintering tungsten carbide with 4.5 to 35% Co added. It is considered that there is strong evidence for the formation of a liquid phase during sintering at temperatures slightly above 1300° C.

5-74. Manufacture and Application of Sintered Carbides. E. M. Trent. *Engineer*, v. 184, Oct. 24, 1947, p. 396-397.

Production, physical properties, and structure, including variations with composition. (To be continued. Condensed from papers presented to the Institution of Production Engineers.)

5-75. Powder Metallurgy in Plastic Cavity Mold Manufacturing. Oliver Pritchard. *Industrial Gas*, v. 26, Nov. 1947, p. 7-9, 27-28.

Powder metallurgy for mass production of molds having complex designs and patterns.

For additional annotations indexed in other sections, see:
1-151; 3-369; 4-175-176; 7-414; 9-168; 10-192-193.

6 CORROSION

6-274. Corrosion Studies in Natural Gas Condensate Wells; Protective Layers. D. A. Shock and Norman Hackerman. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 1283-1286.

The absence of localized attack and the low rate of general attack in a certain type of natural-gas condensate well is believed to be caused by the presence of a naturally occurring inhibitor in the hydrocarbon phase which reacts with the steel surface to form a thin but highly protective layer. An investigation of the hydrocarbon phase disclosed the presence of a constituent not found in a corrosive well. Choice of an inhibitor for a corrosive well. Naphthenic acid was found to be satisfactory. The protection provided by sodium dichromate under these conditions. 16 ref. (Presented at 110th meeting of American Chemical Society, Chicago.)

6-275. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 101A-102A.

Properties and applications of Chlorimets 2 and 3 (high-nickel Mo alloy and high-nickel Mo-Cr alloy, respectively) produced in cast form.

6-276. Cylinder Wear in Diesels—What Causes It; How It Can Be Measured. *SAE Journal*, v. 55, Oct. 1947, p. 31-32, 43.

Based on five papers presented at S.A.E. Summer Meeting, French Lick, Ind., June 6, 1947. Most important factors are shown to be corrosion, abrasion and scuffing.

6-277. Sodium Chloride Versus Construction Materials. *Chemical Engineering*, v. 54, Oct. 1947, p. 211-212, 214, 216, 218.

Part I of a symposium in which typical materials of construction are evaluated for services involving sodium chloride. Iron and steel, by Albert W. Spitz. Worthite, by W. E. Pratt. Chemical porcelain, by John S. Chowning. Silicones, by J. A. McHard.

6-278. Cooperation Hits Corrosion. T. C. Du Mond. *Scientific American*, v. 177, Nov. 1947, p. 210-212.

Cooperative research at Kure Beach, N. C.

6-279. Corrosion in Boiler Feedwater Treating Systems. Part I. Leo F. Collins. *Power Plant Engineering*, v. 51, Oct. 1947, p. 74-76.

The pattern followed by corrosion in systems of this type. (To be continued.)

6-280. The Corrosion of Metals. Part VIII. Aluminum and Its Alloys. (Continued.) *Sheet Metal Industries*, v. 24, Oct. 1947, p. 2026-2028.

Solution potential studies; stress corrosion; influence of forming on stress-corrosion; and effect of composition on stress-corrosion cracking. (To be continued.)

6-281. Corrosion and Growth of Lead-Calcium Alloy Storage Battery Grids as a Function of Calcium Content. U. B. Thomas, F. T. Forster, and H. E. Haring. *Electrochemical Society Preprint 92-12*, 1947, 12 p.

Growth rates of grids containing from 0.077 to 0.137% calcium were measured during a 9-year period of floating service. These were compared with growth rates for grids of 12% lead antimony. 10 ref.

6-282. Buried Pipes. *Iron and Steel*, v. 20, Oct. 1947, p. 484.

Corrosion by sulphate-reducing bacteria.

6-283. The Institute of Metals Autumn Meeting. *Metal Industry*, v. 71, Oct. 3, 1947, p. 279-287; Oct. 10, 1947, p. 302-306.

Abstracts and discussion of the following papers: Surface effects during the annealing of 70:30 brass, by Ivor Jenkins. The centrifugal casting of copper alloy wheels in sand molds, by O. R. J. Lee and L. Northcott. The frictional properties of some lubricated bearing metals, by P. G. Forrester.

6-284. Institute of Metals Autumn Meeting. (Continued.) *Metal Industry*, v. 71, Oct. 17, 1947, p. 326-329.

Summarizes papers and presents discussion on the corrosion of magnesium alloys.

6-285. Treating Steam Chemically to Reduce Return Line Corrosion. A. A. Berk. *Industry and Power*, v. 53, Nov. 1947, p. 79-81, 110, 112.

Tests by U. S. Bureau of Mines indicate that corrosion may be reduced by adding certain amines which vaporize as well as condense with the steam and are returned to the boiler for recirculation. (Based on paper presented at Atlantic City Meeting of National District Heating Association.)

6-286. Refinery Corrosion. C. A. Murray. *Pure Oil News*, v. 30, Nov. 1947, p. 15-17.

A general discussion.

6-287. Corrosion in Condensate Gas Wells. Norman Hackerman and D. A.

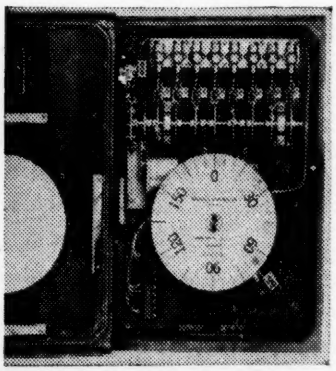
(Turn to page 18)

ransmitter has a port area varied by a plug restrained with a calibrating weight or spring. The plug assumes a position proportional to the rate of flow, and is directly connected to the soft iron core of the telemeter transmitter. Any movement of the plug causes a voltage ratio variation in the telemeter circuit.

Foxboro Co.'s Model 42 transmitter (R-1024) for pneumatic transmission of industrial process measurements such as flow, pressure, liquid level, temperature or humidity, has been redesigned. The most important change in this indicator-type instrument is a completely new transmitting element, which is exactly duplicated in the receiving instrument. Since the transmitting and receiving mechanisms are matched and perfectly linear in calibration, accuracy is improved and calibration simplified.

Time Cycle Controls

Where a number of plant processes must be accurately timed according to a fixed program—such as the opening and closing of valves, switches, dampers, retorts, and presses; and the starting, stopping, or reversing of motor-driven pumps and blowers—the Model C500 impulse-sequence cycle controller



Bristol Time Cycle Controller

has been developed by Bristol Co. (R-1025). Time measurement and pilot valve operation are handled by separate mechanisms. Timing is accomplished by a Telechron-driven aluminum disk on which is printed a 25-in. scale. Notches are cut on this scale for the desired schedule of operations, and the location of these notches determines the time of operation of the cam mechanism.

Time impulses are transmitted electrically. The cams are individually adjustable, and disks for new cycles can be easily made. All controllers are drilled for eight cams and pilot valves.

Manufactured by R. W. Cramer Co., Inc., a time totalizer or running time meter (R-1026) features a counter that can be reset to zero. These meters automatically register total operating or idle time of any circuit, machine or system, and are used for such purposes as checking operating hours of equipment or material to be tested in laboratories, operating time of vacuum tubes so that replacement can be made before failure occurs, timing of pumps and machines. The five-digit revolution-type counter is made of wear resistant metals, and indicates in tenths up to 10,000 hr.

Among the suggested uses of a new time switch made by Palo-Myers, Inc. (R-1027) are: turning on a laboratory furnace in the morning, turning off processing equipment either at or after closing time, and automatic timing of various processes. The clock is of conventional design with a sweep second hand. A snap-action switch is operated by two adjustable fingers, one for "off", the other for "on". The switch actuates a relay capable of breaking 20 amp. of noninductive or heater load. The relay is also rated at 1 hp. of motor load.

Fireye Programming Control Type 24PJ8 is designed to provide automatic starting and programming control for industrial oil burning equipment. It is made by Combustion Control Corp. (R-1028) and is used with photo-electric flame failure scanner Type 45PH5, which protects against flame failure. The control automatically starts a burner in operation and programs a sequence of fuel valve opening, post-ignition time, priming and scavenging.

Timing cams are driven by a high-torque synchronous motor. The fuel valve delay and post-ignition periods can be set upon installation, and a calibrated dial indicates the timing adjustment in seconds.

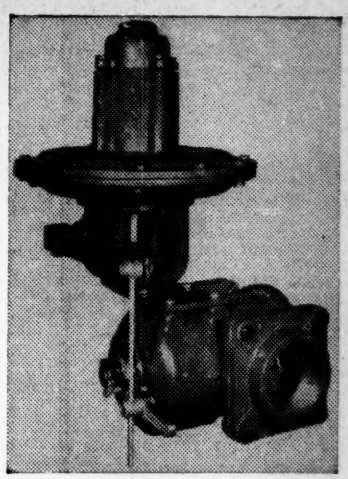
Valves and Other Accessories

The McKee automatic air control valve, Series C, made by Eclipse Fuel Engineering Co. (R-1029), is used with combustion systems controlled by the air only, such as small heat treating furnaces, melting furnaces, and recirculating ovens. It consists of a butterfly valve actuated by an air motor. The small quantity of air that furnishes the motive power may be controlled by either an 8-watt solenoid, a steam pressure valve, a thermostat or a manual valve. The limits of control can be adjusted to the customer's requirements.

Eclipse also makes McKee Kam-Lock safety valves for automatic gas shut-off in case of gas pressure failure (R-1030), and McKee Dual-Lock safety valves for automatic gas shut-off in case of failure of either gas or air (R-1031).

A new solenoid valve has been perfected by Waterman Engineering Co. (R-1032) for hydraulic systems or for handling noncorrosive fluids. It has a maximum working pressure of 3000 psi., and electrical requirements of 6, 12, 24, or 36 volts d.c., with low current consumption of 2.3 amp. at 12 volts. It is available with integral flow rate regulation if desired.

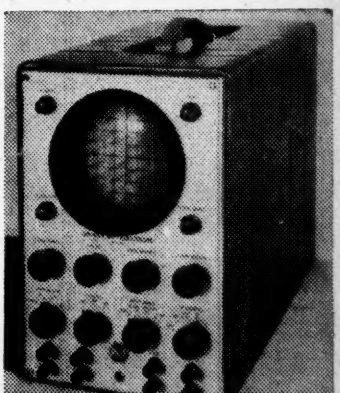
A new product known as the Series



North American Air Motor

600 diaphragm air motor (R-1033) has been designed by North American Mfg. Co. It is intended primarily for use with the North American adjustable port valves, but can be used wherever the need for pneumatic control of industrial heating processes might arise. Accepted pneumatic controller air pressure of 0 to 15 psi. affords an impulse pressure range of 3 to 13 psi. to the diaphragm motor. This results in full travel of the motor arm (26°) and develops 25 in-lb. torque for 1-lb. change in impulse pressure.

The cathode ray oscilloscope WO-60C is a new electronic measuring instrument made by Radio Corp. of America (R-1034). Its uses are many and varied. It will measure mechanical movements as low as 60 r.p.m., assist in the testing of servo mechanisms, and aid in design of supersonic equipment. Instantaneous pressure indications, vibration studies, and strain gage measurements can be made. It is applicable to testing and adjusting thyratron, ignitron and similar electronic control circuits used in modern machines, and also serves as a sensitive voltmeter for a.c. or d.c.



RCA Cathode-Ray Oscilloscope

Shock. *World Oil*, v. 127, Nov. 1947, p. 198, 200, 202, 204, 206.

Study of the phenomena involved, both in the laboratory and in wellhead equipment, indicates some of the contributory causes, from which adequate protective means can be developed. Reviews tests made in three wells and outlines findings as a basis for further work. 16 ref.

6-288. The Chemical Erosion of Steel by Hot Gases Under Pressure. Richard C. Evans and others. *Journal of Physical & Colloid Chemistry*, v. 51, Nov. 1947, p. 1404-1429.

An attempt to simplify the problem by studying the two gases largely constituting the products of combustion, CO and CO_2, and then adding to them, one by one, gases often found as traces, such as H_2S, SO_2, NH_3, N_2O, and H_2. Conditions present when erosion is principally a melting phenomenon and the limits to such a state. The peculiar chemical effects present when the temperature is lower and melting is negligible. Description of apparatus.

6-289. Automatic Device for Study of Intercrystalline Cracks in Boiler Steel. N. G. Patsukov and P. A. Akol'zin. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 577-580. (In Russian.)

A device for simulating conditions within a boiler installation in which there is a slight seepage of water through the riveted joints. Apparatus permits application of constant strain to the sample while regulated "leakage" of water at constant temperature takes place.

6-290. Method for Measuring the Corrosion of Welded Joints. I. I. Frumin. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 693-701. (In Russian.)

Three methods for determining the amount of corrosion are use of the profilometer (for deep penetrating corrosion); differential weight method; and application of stress to joints immersed in concentrated alkali. 10 ref.

6-291. Location and Selection of Anode Systems for Cathodic Protection Units. D. B. Good. *Corrosion*, v. 3, Nov. 1947, p. 539-548.

Deals only with anodes placed in the earth's surface. (Presented at annual meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6-292. Electrical Instruments and Measurements in Cathodic Protection. J. M. Pearson. *Corrosion*, v. 3, Nov. 1947, p. 549-566.

The uses and limitations of techniques or instruments now in use. (Presented at annual meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6-293. Surface Studies of Metals From the Corrosion Standpoint. M. G. Fontana. *Corrosion*, v. 3, Nov. 1947, p. 567-579.

A study of surface films formed on metals at normal and elevated temperatures (a progress report). Passivation of 18-8 stainless steel; procedures and equipment used.

6-294. Cathodic Protection of Hot Water Tanks. J. M. Bialosky. *Corrosion*, v. 3, Nov. 1947, p. 585-591; discussion, p. 591.

Theory of cathodic protection; a system using magnesium anodes. 13 ref. (Presented at annual meeting of N.A.C.E., Chicago, April 7-10, 1947.)

6-295. Test of Nickel-Plated Pipe in Corrosive Distillate Well. B. B. Morton. *Corrosion*, v. 3, Nov. 1947, p. 592.

Value of above as determined by six months' exposure under field conditions.

6-296. Cathodic Corrosion Protection Studied at Dow Chemical's Metals Protection Laboratory. *Steel*, v. 121, Nov. 10, 1947, p. 106-107, 124.

Facilities, equipment, and procedures. Some of the research programs.

6-297. Application of Corrosion Resisting Materials to Railroad Electrical Construction. *Railway Mechanical Engineer*, v. 121, Nov. 1947, p. 620-621.

Data derived from tests made over a period of years on corrosion resisting materials. In all cases, samples of various metals and alloys were suspended overhead and were removed, examined, cleaned, and weighed at intervals. The materials included various types of aluminum alloys, brass, leaded brass, muntz metal, a wide variety of bronzes, copper, copper-nickel alloy, chromium-nickel alloy, malleable iron, ingot iron, wrought iron, carbon steel (black), carbon steel (galvanized), copper-bearing iron and steel, and chromium-nickel steel.

6-298. The Cracking of Boilers. *Railway Mechanical Engineer*, v. 121, Nov. 1947, p. 642-645.

Results of a study of the nature of cracking at riveted seams and other places in the boiler with some conclusions as to means for dealing with this problem. (Presented at meeting of the Master Boiler Makers' Assoc., Chicago, Sept. 15-18, 1947.)

6-299. Problems in Cathodic Protection. Frank E. Dolson. *Journal of the American Water Works Association*, v. 39, Nov. 1947, p. 1079-1086, 1088-1089; discussion, p. 1086-1088.

Problems involved in thus protecting underground water-pipe against corrosion.

6-300. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 39, Nov. 1947, p. 87A-88A.

Stress corrosion—one of 8 forms into which corrosion is classified according to appearance of the corroded metal.

For additional annotations indexed in other sections, see:
7-440; 27-250.

7 CLEANING & FINISHING

7-405. Beneficiation of Over-Spray Porcelain Enamel. Donald W. Scott, L. A. Roe, and B. J. Sweo. *Mining Technology*, v. 11, Sept. 1947, T.P. 2253, 12 p.

Application of ore-dressing methods to the recovery of nearly pure frit or glass from over-spray, or waste, porcelain enamels. Clay, organic dye and dirt can be removed to yield a beneficiated enamel acceptable for interior one-coat finishes in regular plant practice. Flow sheet, involving screening, flotation, and magnetic separation.

7-406. Anodizing of Aluminum. *Light Metal Age*, v. 5, Oct. 1947, p. 22-24.

A brief survey of some of the more general factors involved.

7-407. A Comparison of Pickling Acids. *Wire Industry*, v. 14, Oct. 1947, p. 558.

Compares hydrochloric and sulphuric acids.

7-408. Conventional Pickle Practice. A. M. Langbein. *Better Enameling*, v. 18, Oct. 1947, p. 6-7, 22-23, 26-30.

Operations of a manually-operated pickling room giving cost data. (Presented at Porcelain Enamel Institute Forum, Columbus, Ohio, Sept. 11, 1947.)

7-409. Chemical Treatments for Zinc Surfaces—a Review. H. A. Holden. *Sheet Metal Industries*, v. 24, Oct. 1947, p. 1975-1983.

67 references. (Presented at Third International Conference on Electrodeposition organized by the Electrodepositors' Technical Society.)

7-410. The Principles and Scientific Applications of the Electrolytic Polishing of Metals. P. A. Jacquet. *Sheet Metal Industries*, v. 24, Oct. 1947, p. 2015-2025, 2030.

Metallography; study of surface properties; study of oxidation and corrosion; X-ray and electron diffraction; suppression of cold emission of metallic surfaces in high vacuum; study of thin deposits and single crystals. 161 ref. (Presented at the 3rd International Conference on Electrodeposition organized by the Electrodepositors' Technical Society.)

7-411. New Bonderizing Process for Aluminum and Steel. Harold A. Knight. *Materials & Methods*, v. 26, Oct. 1947, p. 99-101.

Problems encountered in using sheet steel and sheet aluminum on the same production line are lessened by a phosphate treatment which works equally well on both materials with identical treatments.

7-412. Ties Life of Parts to Painting Method. *SAE Journal*, v. 55, Oct. 1947, p. 60.

Recommended surface cleaning and painting methods for bus and truck parts. Based on "Organic Finishes for Increasing the Life of Bus and Truck Parts", by Roy B. Davis. (Presented at S.A.E. Transportation Meeting, Chicago, April 16, 1947.)

7-413. Preparing Steel for Porcelain Enameling. G. H. McIntyre. *Stove Builder*, v. 12, Oct. 1947, p. 39-45, 105-111.

Steel differences; nickel flash; variables to be controlled; recommended sequence for nickel flash.

7-414. Metallic Pigment Progress (Gold Bronze, Aluminum Powder). Henry H. Mandle. *Organic Finishing*, v. 8, Oct. 1947, p. 12-13, 15-17, 19-21, 23.

Nontechnical article deals with the progress and development of bronze powders for use with lacquers and other organic finishes. 18 ref.

7-415. Protecting Magnesium Alloys. Rick Mansell. *Organic Finishing*, v. 8, Oct. 1947, p. 24-30.

Adhesion difficulties with organic coatings; alkaline-peeling theory; galvanic corrosion; chemical and electrochemical coatings; surface pretreatments; primers; finishes; test methods and results.

7-416. Finishing Elevator Car Interiors. *Organic Finishing*, v. 8, Oct. 1947, p. 41-43.

Procedures.

7-417. Protective Coatings. *Organic Finishing*, v. 8, Oct. 1947, p. 47-48, 68.

Organic finishes; metal coatings; galvanizing.

7-418. Painting and Enameling Domestic Units at "Hotpoint" Appliance Plant. *Industrial Heating*, v. 14, Oct. 1947, p. 1700-1702, 1704, 1706, 1708.

Procedures and equipment. (To be continued.)

7-419. Protective Wire Coating Production Accelerated. Charles W. Ange. *Industrial Gas*, v. 26, Oct. 1947, p. 13-14.

Application of lead-alloy coating known as Okoloy to copper conductors.

7-420. Scuff and Wear Resistant Chemical Coatings. F. C. Young and B. B. Davis. *SAE Quarterly Transactions*, v. 1, Oct. 1947, p. 626-629, 661.

Results of an investigation of three types of surface treatment for cast iron and steel which give superior wear and scuff resistance. These are: immersion in a bath of 50% NaOH containing 1% sulphur; formation of an iron oxide coating of the desired type ($FeO + Fe_3O_4$) by a furnace procedure; and immersion in a manganese phosphate bath. (Presented at S.A.E. Annual Meeting, Detroit, Jan. 6, 1947.)

7-421. A Four-Story Millroom Is Interesting Feature at Consolidated-Vultee

(Turn to page 20)

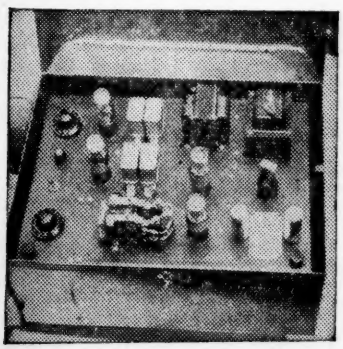
It operates from almost zero input, has zero inertia, and practically unlimited speed of response. It has wide range, smooth and stepless control, and no moving parts. It is suitable for measuring very small quantities, for rapidly changing quantities, and for very short time intervals. Its useful range is 0.5 to 300,000 cycles.

Specialized Applications

A new temperature-recording instrument for continuous porcelain enameling furnaces has been developed by the Ferro Enamel Corp. and dubbed "Hot Hawkshaw, the thermal ferret" (R-1035). An electronic, three-point recorder, it determines the exact temperature of the ware in the furnace and at various levels, the differences in temperature of light and heavy-gage ware, of furnace loadings and of burner adjustments.

In operation, three 20-ft. thermocouples are placed at appropriate spots on the ware, which is hung on the conveyer and run through the furnace at normal load. The instrument records the temperature every 3 sec. throughout the length of the furnace from preheating zone through the cooling zone. Three curves are imprinted on the chart, which can then be studied for appropriate setting of the furnace control instruments.

Periodic reverse current plating, an improved method developed by Westinghouse engineers during the past year, involves plating in the conventional fashion for a given length of time, followed by current reversal for a short period. An electronic controller for timing the reversal periods has now been developed by Hanson-Van Winkle-Munning Co. (R-1036) in cooperation with Westinghouse Electric Corp.



Controller for Periodic Reverse-Current Electroplating

Time intervals of 2 to 20 sec. are provided for the plating cycle with ½ to 5 sec. for the reverse current cycle. This wide range of intervals is designed to accommodate different types of plating solutions as well as experimentation.

An automatic timing unit has been added during the past year to the Cleveland universal die-casting machine manufactured by Cleveland Automatic Machine Co. (R-1037). An electric control panel is hooked up with three timers (solenoid valves) for controlling length of holding time, time of pulling cores, and the opening of the dies. Provision has been made so that the machine can be operated manually while setting up a job and changed to automatic control for steady operation simply by pushing a button.

Exact photo-electric temperature control is a particular feature of the No. 3 Cheston full-automatic metal heater made by Frank C. Cheston Co. (R-1038). Material is fed automatically from hoppers through a chute and picked up by movable fingers and placed between the electrodes, which are then closed. When the piece reaches the proper temperature the electric eye cuts off the current, opens the electrode, and the piece drops onto an inclined roller chute which carries it to the operator at the upsetter. The use of photo-electric controllers eliminates overheating or underheating.

Inspection Instruments

Gages, comparators and sorting devices of great precision, accuracy and ingenuity are constantly being invented for process control. Limited space precludes extended descriptions of these, particularly since many were given in the May 1947 issue of *Metals Review* which covered the field of testing and inspection. Only a few representative instruments will be mentioned here.

The Sperry Reflectogage (R-1039) utilizes supersonics for thickness measurement where access can be had to only one side of the material. It is similar in principle to the Sonigage described on page 23 of the November issue of *Metals Review*.

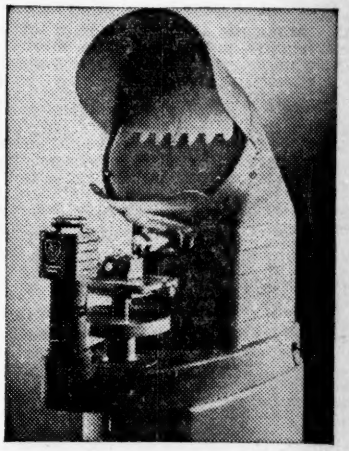
An electronic gage installed by SKF Industries (R-1040) measures differences to within three millionths of an inch in the inspection of tiny steel roller bearings. An electronic eccentricity gage manufactured by Moslo Machinery Co. (R-1041) tests welding rods during the extruding process before or after baking, and shows eccentricity in 0.001-in. increments.

Two new optical comparators have recently been introduced. American Optical Co.'s instrument (R-1042) is equipped with special staging fixtures and coordinated chart gages to accommodate scores of complex inspection problems ranging from pins to propellers and from taps to turbines. The viewing screen has a 16-in. diameter image area and interchangeable magnifications of 10, 20, 31.25, and 62.5X.

A new Wilder projector and optical comparator marketed by George Scherr Co. (R-1043) is suitable not only for continuous quantity inspection, but also for delicate assembly operations on minute parts in the watch, instrument, and electronic tube industry; the work stage and the observation screen are close to each other, within the operator's easy reach and line of vision.

An instrument for a laboratory inspection purpose is the new grain size comparator developed in Westinghouse Research Laboratories (R-1044). It consists of a ground-glass screen hinged to an illuminating unit with a slotted wooden frame, and is easily attached to a standard metallograph. The sample to be determined is projected on the glass screen, and a transparent slide of a known standard grain structure is slipped into the wooden frame. The bellows of the metallograph is then adjusted until the unknown image matches the standard, and the amount of adjustment is translated into grain size by reference to a standard graph.

In the field of surface studies, Physicists Research Co. has supplemented its



American Optical Comparator

Profilometer with a Proficorder (R-1045), which gives a clear chart record of the shape, height and spacing of widely spaced surface irregularities, shows fine roughness irregularities in full detail, and permits direct comparison of profiles of a wide variety of surfaces at the same magnification. The Proficorder consists of tracer, piloting fixture for mounting the piece being measured, and amplicorder (amplifier, chart and control cabinet).

For measuring surface roughness of castings, a simple instrument, known as the Hobman-Meehanite surface meter (Meehanite Metal Corp.—R-1046), consists of a tripod support that rests on the casting, a phonograph needle mounted 0.079 in. off center which rotates about a disk with 50 graduations in 0.01-in. increments, and a dial.

Laboratory Analysis

The reader is referred to page 17 in the October issue of *Metals Review* for a number of new and improved pieces of analytical equipment of particular use in the steel plant. Reference is made to the Coleman 6A Junior Spectrophotometer which is marketed by Burrell Technical Supply Co. as well as Wilkens-Anderson Co. (R-1047). This is a simplified version of the universal

Aircraft Corp. *Enamelist*, v. 24, Oct. 1947, p. 14-17.

Layout, equipment, and procedures for porcelain enameling.

7-422. Continuous Cleaning and Pickling of Parts for Porcelain Enamel With Cable-Type Pressure Spray Machine. George N. Tuttle. *Enamelist*, v. 24, Oct. 1947, p. 4-7, 58-59.

Design and operation of above machine. (Presented at 9th Annual Porcelain Enamel Institute Forum, Columbus, Ohio, Sept. 10-12, 1947.)

7-423. Practical Facts About Polishing and Buffing Compounds. Part I. Howard J. McAleer. *Die Castings*, v. 5, Oct. 1947, p. 62-64.

What is accomplished by buffing and polishing; types of compounds used; abrasives and binders; methods of spray gun application. (To be continued.)

7-424. Suppression of Radiations at High Temperatures by Means of Ceramic Coatings. D. G. Bennett. *Journal of the American Ceramic Society*, v. 30, Oct. 1, 1947, p. 297-305.

Development of a method for measuring the emissivities of ceramic-coating materials with respect to oxidized stainless steel. The emissivities were studied from 800 to 1600° F., and were found to cover a range from more than 100% to less than 10%. Lepidolite was the highest emitter, Uverite the lowest. High-temperature ceramic paints were found to be effective radiation suppressors and thermal insulators. (Presented at 49th Annual Meeting, American Ceramic Society, Atlantic City, N. J., April 23, 1947.)

7-425. A Study of Dry-Process Cast-Iron Ground-Coat Enamels. R. R. Danielson and J. H. Koenig. *Journal of the American Ceramic Society*, v. 30, Oct. 1, 1947, p. 306-311.

Results of a study of variation in firing treatment of ground coats for cast iron and resulting effects on the quality of adherence and the tendency to blister of dry-process enamels. Impact resistance of enameled specimens. Plans for further studies. (Presented at 49th Annual Meeting, American Ceramic Society, Atlantic City, April 24, 1947.)

7-426. Finishes for Insides and Outsides of Metal Containers. J. H. McKenzie. *Industrial Finishing*, v. 23, Oct. 1947, p. 36-38, 40, 42.

Methods of applying durable coatings; tests.

7-427. Finishing Otis Elevator Cabs. *Industrial Finishing*, v. 23, Oct. 1947, p. 46-48.

7-428. Production Painting and Baking of Automobile Parts. M. J. Fehlen. *Industrial Finishing*, v. 23, Oct. 1947, p. 54-56, 58, 60.

How new automobile parts are spray painted and baked on a fast production basis in a minimum area.

7-429. Spray Painting Automobile Moldings. Glenn Ferdon. *Industrial Finishing*, v. 23, Oct. 1947, p. 62-64, 66.

New conveyerized, automatic, electrostatic spray-painting setup.

7-430. Roller Coating Venetian Blind Slats. William F. Trilk. *Industrial Finishing*, v. 23, Oct. 1947, p. 72-74, 76.

How a portable roller coater finishes 2 sides and 2 edges of Venetian blind slats, rails, and fascia boards.

7-431. Coating Products With Flock. Arthur P. Schulze. *Industrial Finishing*, v. 23, Oct. 1947, p. 77-78, 80, 82.

Coating of metal, wood, paper, cloth, or plastic surfaces with rayon or cotton flock.

7-432. Chemical Polishing of Aluminum. Charles C. Cohn. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 102.

Advantages of chemical over electrolytic polishing. Properties and requirements common to both processes.

7-433. Pore Size in Protective Films by Electrographic Printing. W. E. Shaw and E. T. Moore. *Analytical Chemistry*, v. 19, Oct. 1947, p. 777-779.

Technique for determining porosity in protective coatings which involves the use of a sandwich consisting of metal pressure platens, a sheet of absorptive paper in contact with the area of coated metal to be studied, and the proper electrolyte. Pressure, voltage, and time, as well as developing agent, are important for proper printing.

7-434. Porcelain Enameled Products in the Home. W. H. Pfeiffer. *Engineering Experiment Station News (Ohio State University)*, v. 19, Oct. 1947, p. 16-23.

Manufacture and properties.

7-435. Oxide Conditioning Speeds Pickling Operations. C. B. Murton, Jr., and M. F. Hawkes. *Iron Age*, v. 160, Oct. 30, 1947, p. 46-48.

The various oxide components and the manner in which they affect pickling. Methods of oxide conditioning to obtain rapid and efficient scale removal.

7-436. Production-Line Rustproofing. A. D. Stout, Jr. *Iron Age*, v. 160, Oct. 30, 1947, p. 64-65.

Production-line methods at Newark Stove Co.—the first major installation of the new Banox rustproofing process, developed by Calgon, Inc.

7-437. Bright Annealing for Cleaning Kitchenware Prior to Porcelain Enameling. Albert R. Mallonn. *Finish*, v. 4, Nov. 1947, p. 20-21, 53, 56.

An outline of equipment, costs, and results based on 16 months' experience. (From paper presented at Porcelain Enamel Institute's 9th Annual Forum, Columbus, Ohio.)

7-438. Program Report of Ninth Annual P.E.I. Forum. (Continued.) *Finish*, v. 4, Nov. 1947, p. 22-25, 38, 40.

Authors' résumés or excerpts of following papers: Spray pickling, by H. C. Ellinger. Immersion tubes, open pressure burner fired, by S. E. Shepard. Fuel oils in porcelain enameling, by William M. Jones. Use of propane and butane at enameling plants, by E. A. Jamison.

7-439. A Two Continuous Furnace Plant for Stove Work and Jobbing. Val J. Cichowski. *Finish*, v. 4, Nov. 1947, p. 15-18, 61-62.

Enameling plant for high-speed production of flatware using two furnaces, one for ground coat and one for white coat.

7-440. Symposium on Modern Metal Protection. *Steel*, v. 121, Nov. 3, 1947, p. 90-91, 122, 124, 126, 128, 131-132, 134.

Condensed versions of seven papers presented at meeting sponsored by American Chemical Society, American Institute of Chemical Engineers, and Electrochemical Society at Cleveland: Selection of protective coatings for metals, by K. G. Compton. Organic coatings for corrosion protection, by George W. Seagren. Synthetic rubber derivatives as corrosion resistant coatings, by J. B. Martin. Protective coatings for high-temperature applications, by W. N. Harrison. Corrosion resistant chemical equipment of stainless steel, by W. R. Meyer and H. L. Maxwell. Corrosion resistance of nickel-base alloys and applications in processing equipment, by R. B. Long. Some notes on corrosion behavior of high-nickel alloys and stainless steels, by H. O. Teeple.

7-441. How to Clean Metals. Harry S. Wharen. *American Machinist*, v. 91, Nov. 6, 1947, p. 109-124.

Report deals largely with steel, and metal cleaning as a manufacturing process. The various cleaning materials and methods: solvent cleaners; emulsifiable cleaners; alkaline cleaners; acid pickling; and dip and spray rinsing.

7-442. *Reynolds Metals Technical Advisor*, v. 1, no. 5, 1947, p. 1.

Recommendations for cleaning, surface treatment, and priming.

7-443. Regalvanizing of Welded Joints. George H. Ohmer. *Corrosion*, v. 3, Nov. 1947, p. 580-584.

Procedure for application of low-melting zinc-base alloy to areas on galvanized objects where the original zinc coating has been destroyed by welding or by other means.

7-444. Discussion of Paper, Chemical Reaction in Metal Protective Paints. W. Beck. *Corrosion*, v. 3, Nov. 1947, p. 593-594.

E. J. Dunn found a remarkable drop in the acid number of extracted, dried, linseed-paint films when these contained reactive lead oxide pigments (Aug. issue of *Corrosion*—see item 7-322.) W. Beck has measured the pH of the swelling water of the paint film and confirms the author's results.

7-445. Production Metalizing for Surface Protection. Robert Steele. *Production Engineering & Management*, v. 20, Nov. 1947, p. 56-59.

Automatic equipment for the application of a protective coating to arc welded sections solves the problem of replacing the burned-off galvanizing.

7-446. Possibilities of Zinc Coatings on Drill Pipe. L. R. Jackson, H. M. Banta, R. C. McMaster, and J. Bernbaum. *Drilling Contractor*, v. 3, Oct. 15, 1947, p. 50-51.

Zinc plating, even when scratched, greatly prolongs the operating life of steel under test conditions simulating drill-string service. Zinc coating stood up much better than plastic coatings under the same test conditions.

7-447. Painting, Varnishing and Lacquering of Light Metal Surfaces; Continental Practice. A. K. Overrath and Edmund R. Thews. *Paint and Varnish Production Manager*, v. 27, Nov. 1947, p. 295-298, 300.

The problems involved; recommended materials and procedures.

7-448. Functions of Organic Coatings in Present-Day Engineering Problems. J. J. Mattiello. *Paint and Varnish Production Manager*, v. 27, Nov. 1947, p. 300-304.

Surface preparation; electrical insulation; food and chemical containers—metal; marine paints; structural steel painting; naval aircraft; railroad paints; infrared reflecting paints; other engineering fields; plastics vs. organic coatings; economics.

7-449. New Enamel Plant Geared for Top Production. *Ceramic Industry*, v. 49, Nov. 1947, p. 65-66, 112, 114, 116.

Procedures, equipment, and layout for electric range production.

7-450. Beautyware Finishes. Bryant W. Pocock. *Products Finishing*, v. 12, Nov. 1947, p. 20-22, 24, 26, 28, 30, 32.

Procedures used in making bathtubs, lavatories, and sinks.

7-451. Glycerine in Electrolytic Treatment of Aluminum and Its Alloys. Georgia Leffingwell and Milton A. Lesser. *Products Finishing*, v. 12, Nov. 1947, p. 36, 38, 40, 42, 44, 46.

A review. 22 ref.

7-452. Finishing Clinic. Allen G. Gray. *Products Finishing*, v. 12, Nov. 1947, p. 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72.

Recent developments in the use of conversion coatings on zinc-plated steel; advantages of automatic hot zinc galvanizing in production units; proper surface preparation for porcelain enameling; determination of adhesion of plated coatings on aluminum.

7-453. Barrel Finishing of Metal Products. Part 15—A Discussion Concerning Barrel Loads and Barrel Speeds. H. Leroy Beaver. *Products Finishing*, v. 12, Nov. 1947, p. 76, 78, 80, 82, 84, 86, 88.

(Turn to page 22)

Dietert's Carbon Determinator

spectrophotometer designed specifically for the industrial laboratory where precision and reliability must be combined with rugged convenience. Simplified controls and direct-reading scales retain the full accuracy of the universal, yet provide greater speed and simplicity.

The instrument operates on the principle of color as a method of identifying constituents in solution. First, it provides a means of determining the exact color (light wavelength) most responsive to the constituent being measured; second, it generates light of the exact wavelength; and third, it provides a means of measuring accurately the intensity of that light as affected by the constituent.

The Quantometer (R-1048), a direct reading spectrometer which gives simultaneous analyses of as many as 16 elements in one sample, has been perfected by Applied Research Laboratories. A description of the instrument and its application in a specific industry is given in the December issue of *Metal Progress*, page 975.

An X-ray photometer which carries quantitative analysis beyond the range of the visible spectrum has been developed by General Electric Co. (R-1049). It is particularly useful in measurements where the controlling component is of considerably higher atomic number than that of the other constituents of the product being measured.

The equipment depends upon the null method, in which the unknown is balanced with a known, both of which respond in the same way to variations in X-ray intensity.

Another apparatus that utilizes X-rays is the Norelco Geiger-counter fluorescence analysis unit, exhibited for the first time at the National Metal Exposition in October by North American Philips Co. (R-1050). Essentially it consists of an X-ray generator, a rotating indexing holder for four specimens, a special collimating system, a crystal, a goniometer having a scale graduated from 0 to 90°, and a Geiger counter. Crystal and Geiger counter are mounted on and positioned by arms which traverse the goniometer arc. The X-ray method permits multiple analyses without destroying the specimen, and rapid determination of the percentage of a component present in large or small proportions.

A new Hi-Precision carbon determinator available from Harry W. Dietert Co. (R-1051) eliminates errors caused by temperature changes during analysis by adding a combustion gas-cooler that introduces the gases into the burette at room temperature. A new one-piece burette-absorber design prevents any temperature difference between the burette and absorber.

A new moisture determinator announced by Laboratory Equipment Corp. (R-1052) is based on generation of acetylene gas. The sample is intimately mixed with calcium carbide. Chemical reaction with moisture in the sample generates acetylene gas. The gas enters a burette calibrated to read directly in percentage of moisture present in the sample.

Miscellaneous Laboratory Equipment

For the chemical laboratory Precision Scientific Co. has invented a dual automatic recording device known as the Recordomatic Titrator (R-1053). The instrument consists of a reagent-feeding device and a recording potentiometer; it records titration curves in permanent form and can operate continuously. The only work for the operator is to prepare solutions and load the feed unit.

Specialized cameras for delicate recording include an asymmetric 20-cm. diameter focusing camera equipped to fit either Philips or Picker X-ray diffraction apparatus. It is a product of the George C. Wyland Laboratories (R-1054). The camera combines short exposures with high resolution, sharp diffraction lines, and provision for use of either solid specimens or powder; its large radius (10 cm.) makes it most effective for the analysis of mixtures. For example, a single X-ray pattern of a solid sample of steel disclosed four phases whose lines usually interfere in other cameras—namely, austenite, ferrite, sigma phase and cubic chromium carbide. The camera range extends well into the back reflection region, and other features are specimen oscillation and facilities for mounting reference foils for quantitative analysis.

Fairchild Camera and Instrument Corp. has announced the new Oscillo-Record camera, operated electronically for recording oscilloscope traces (R-1055). It can be mounted atop standard laboratory oscilloscopes, uses 35-mm. film for either still or continuously moving records, and photographs high-speed as well as very low-speed phenomena. By adjusting the speed of the film, the camera records each successive sweep of the oscilloscope across the film without the use of a shutter. Film rate is adjustable from 1 to 3600 in. per min.

READER SERVICE COUPON

Check These Numbers for Production Information and Manufacturers' Catalogs. The following numbers refer to the new products listed in the preceding article.

THIS COUPON IS VOID AFTER MARCH 1, 1948

Metals Review, December 1947

R-990	R- 999	R-1008	R-1017	R-1026	R-1035	R-1044	R-1053
R-991	R-1000	R-1009	R-1018	R-1027	R-1036	R-1045	R-1054
R-992	R-1001	R-1010	R-1019	R-1028	R-1037	R-1046	R-1055
R-993	R-1002	R-1011	R-1020	R-1029	R-1038	R-1047	
R-994	R-1003	R-1012	R-1021	R-1030	R-1039	R-1048	
R-995	R-1004	R-1013	R-1022	R-1031	R-1040	R-1049	
R-996	R-1005	R-1014	R-1023	R-1032	R-1041	R-1050	
R-997	R-1006	R-1015	R-1024	R-1033	R-1042	R-1051	
R-998	R-1007	R-1016	R-1025	R-1034	R-1043	R-1052	

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7-454. Practical Applications of Modern Products. *Products Finishing*, v. 12, Nov. 1947, p. 90, 92, 94, 96, 98.

Elevator interiors are finished to retain tonal values and reflectiveness. Phosphatizing process utilizes gas immersion heaters.

7-455. Sur Les Etats de Surface Actif et Passif Créés par le Polissage Electrolytique sur l'Aluminium, le Zinc et le Fer. (Concerning the Active and Passive Surface States Created by Electropolishing Aluminum, Zinc, and Iron.) Pierre Morize. *Métaux et Corrosion*, v. 22, May 1947, p. 71-80; June 1947, p. 101-108.

The oxidation of the surfaces of metals, particularly aluminum, zinc, and iron. Both mechanically polished and electropolished surfaces are studied with particular emphasis on the latter. The relation between solution potential and crystal structure. Oxidation of zinc at room temperature, based on solution potentials. 43 ref.

7-456. Passivation des Aciers Inoxydables. (Passivation of Stainless Steels. Parts III and IV.) (Concluded.) L. Guitton. *Métaux et Corrosion*, v. 22, May 1947, p. 80-89.

Successful application of laboratory work on passivation of 18% Cr-8% Ni-3% Mo and 18% Cr-10% Mn stainless steels on a semicommercial scale.

7-457. A Note on the Electrolytic Polishing of Silver. R. Shuttleworth, R. King, and Bruce Chalmers. *Metal Treatment*, v. 14, Autumn 1947, p. 161-163.

Simple method for the electrolytic polishing of relatively large areas of silver without preliminary grinding on emery paper.

7-458. Chromate Passivation of Sprayed Zinc Coatings. E. E. Halls. *Metal Treatment*, v. 14, Autumn 1947, p. 164-168.

Corrosion tests on sprayed zinc coatings on steel with particular reference to use of sulphuric acid-sodium dichromate solution.

7-459. La Peinture de l'Aluminium. (Painting of Aluminum. Part I.) J. J. Meynis de Paulin. *Revue de l'Aluminium*, v. 24, Oct. 1947, p. 309-317.

Preparation of the surface of light alloys, particularly aluminum alloys, for painting or other finishing operations. Various methods of degreasing and cleaning as well as chemical and anodic oxidation. Methods of application.

7-460. Modern Mechanical Surface Finishing. Martin Manler. *Metal Finishing*, v. 45, Nov. 1947, p. 62-66.

A review of equipment, procedures and materials. 17 ref. (To be cont.)

7-461. Pretreatment for Barrel Plating. Mario Mazzone and Floyd McKnight. *Metal Finishing*, v. 45, Nov. 1947, p. 75-77, 82.

Practical recommendations for chemical and mechanical surface treatments prior to the plating operation.

7-462. Tricks of the Polishing Trade. H. Moore. *Metal Finishing*, v. 45, Nov. 1947, p. 78-79.

Practical hints on holders for polishing and buffing parts which are otherwise difficult to handle.

7-463. Painless Finish for Stainless. *Industrial and Engineering Chemistry*, v. 39, Nov. 1947, p. 14A, 16A.

Use of new electropolishing solution developed by Du Pont for stainless steels.

7-464. Tarnishing and Related Phenomena. U. R. Evans. *Sheet Metal Industries*, v. 24, Nov. 1947, p. 2189-2193, 2205.

A mathematical analysis of the principles of film growth and methods of improving resistance to tarnishing, including carefully controlled composition and pretreatment of alloys (selective oxidation, and electrodeposition of protective beryllia and alloy coatings). 22 ref. (Presented at the 3rd International Conference on Electrodeposition of the Electrodepositors' Technical Society, London.)

7-465. A Survey of Modern Methods for the Application of Paint to Metal Surfaces. J. N. T. Adcock. *Sheet Metal Industries*, v. 24, Nov. 1947, p. 2227-2232.

Pretreatment, baking procedures, application methods. (Presented at Autumn Conference of Sheet and Strip Metal Users' Technical Assoc.)

7-466. Some Special Applications of the Electrolytic Polishing of Metals. H. C. J. de Decker, A. P. Krijff, and J. M. Pluut. *Sheet Metal Industries*, v. 24, Nov. 1947, p. 2235-2242.

Electrolytic polishing methods for carbon steels, zinc alloys, and lead alloys. While the primary object is to facilitate the metallographic examination of these materials considerable light is thrown on the nature of the distortion in the surface layers caused by mechanical polishing. (Presented at 3rd International Conference on Electrodeposition of the Electrodepositors' Technical Society, London.)

7-467. Production Coating Under High Vacuum. *Modern Plastics*, v. 25, Nov. 1947, p. 128.

Automatic machine for vapor deposition of metals onto plastics, paper, cloth, or glass, at pressures below 10^{-3} mm. Hg.

7-468. A Study of the Dielectric Strength of Paint, Varnish and Lacquer Films. *American Paint Journal (Convention Daily)*, v. 32, Nov. 8, 1947, p. 8, 10-11, 13-15, 17-19.

Apparatus and standard technique developed. Extensive test results for different organic films on steel, copper, tin, aluminum, nickel, monel, and Inconel. The latter in the rolled and annealed state proved most suitable. Work is planned to determine whether the base-metal composition has any effect other than that due to its surface condition.

7-469. Further Investigation of Aqueous Dispersions of Vinyl Polymers. *American Paint Journal (Convention Daily)*, v. 32, Nov. 8, 1947, p. 19-20, 22-30.

Continuation of work reported in 1946 by the Chicago Club on polymer dispersions. New data on compounding technique and proper methods of pigmentation. Factors governing stability were determined and a test devised by which stability can be predicted. Comparative stability of various lattices. A rapid method to determine flow properties, and the close association of flow behavior with application characteristics. Physical and chemical properties of vinyl films are compared with conventional varnish and alkyd films. Further information on Geon, Acrysol, and Saran and more recent work with Latex 512. Use of vinyl dispersions as metal finishes.

7-470. A Study of Primers for Ferrous Metals in an Atmospheric Exposure. Report III. *American Paint Journal (Convention Daily)*, v. 32, Nov. 14, 1947, p. 23-28.

Details of the method of preparation and exposure procedure for the specimens of the general series outlined previously. No exposure data are available as yet.

For additional annotations indexed in other sections, see: 12-197; 13-50; 18-235; 21-107; 22-664; 23-426-455; 27-245.

8 ELECTROPLATING

8-157. Anodes—IV. Operating Factors Involved in the Utilization of Gold. V. Zinc—Cadmium—Tin—Lead. E. R. Thews. *Metal Industry*, v. 71, Sept. 26, 1947, p. 268-269; Oct. 10, 1947, p. 307-309.

The utilization of gold anodes for practical plating purposes. The elimination of the excessive solubility of pure zinc anodes and the effect of alloying additions to cadmium anodes. Tin and lead anodes also mentioned briefly.

8-158. A Semi-Quantitative Method for Measuring the Ductility of Chromium Electrodeposits. M. R. J. Wyllie. *Electrochemical Society Preprint 92-5*, 1947, 17 p.

The Dubpernell test was adapted for assessing quantitatively both initial porosity and cracking of chromium plate after elongation. Under the conditions used, porosity always takes the form of small circular holes in the deposits. Relationships of porosity and cracking and the effect of electroplating bath temperatures and other factors on these phenomena.

8-159. Electrolytic Reduction of Acetone to Pinacol. O. C. Slotterbeck. *Electrochemical Society Preprint 92-10*, 1947, 12 p.

A continuous process. These cathodes are easily prepared by electrodepositing a relatively thin film of lead on a copper surface. Studies made of various other types of cathodes indicate that zirconium-plated copper is the only one that shows any promise. 12 ref.

8-160. Electrolized Tools. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 91.

New process for prolonging the life of cutting tools is now being applied to drills, reamers, end mills, keyway cutters, and center drills as well as other kindred cutting tools. The basic principle is the deposition of 0.000002 in. of an unusually hard alloy, so applied that, in effect, there is no internal or external change in the dimensional accuracy of the tools processed. Details are not given.

8-161. Plating Bath Voltage. G. W. Croninger and J. B. Mohler. *Iron Age*, v. 160, Oct. 30, 1947, p. 66-68.

Resistivity data for a number of common plating baths and an explanation of the use of these data for calculating plating bath voltage, particularly useful when using high current density baths. Such data also indicate changes in conditions that will reduce the required voltage.

8-162. Sources of Impurities in Electroplating Solutions. Myron B. Diggin. *Monthly Review*, v. 34, Nov. 1947, p. 1236-1242.

The various types; inorganic impurities in solution; organic impurities in solution; solid and dispersed impurities; gaseous impurities.

8-163. Continuous Electrolytic Solution Purification. C. E. Heusser and L. M. Morse. *Monthly Review*, v. 34, Nov. 1947, p. 1243-1249.

Principles of such a method developed for use in the plants supplying Chrysler Corp. 10 ref.

8-164. Features of the Slot Plating Range Cell. J. B. Mohler. *Steel*, v. 121, Nov. 3, 1947, p. 92, 118

Test cell designed to determine the range of effective current densities. A slot in front of the actual anode controls the distribution of current over the cathode. The latter is inclined in such a way that the current density along its length decreases exponentially as the distance from the slot increases. The slot anode is not subject to changes in concentration and polarization that take place at a real anode.

8-165. Coordination Compounds in the Electrodeposition of Chromium. R. W. Parray, Sherlock Swann, Jr., and John C. Ballar, Jr. *Electrochemical Society Preprint 92-27*, 1947, 12 p.

Plating of chromium from solutions of aqua and other complexes. Chromic sulphate solutions are superior to

(Turn to page 24)

Appointments to A.S.M. Standing Committees

At the meeting of the Board of Trustees of the American Society for Metals held Oct. 24, new appointments to the various national committees of the Society were announced by President Foley and confirmed by the Board. The complete personnel of the standing committees is listed below. The new appointments are shown in italics and the numerals represent the date of expiration of membership.

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A. S. Jameson, International Harvester Co., Chicago, '50.
Milo Stutzman, Midwest Research Institute, Kansas City, Mo., '49.
William W. Wight, Pratt & Whitney Division, West Hartford, Conn., '50
Arthur E. Focke, Diamond Chain and Mfg. Co., Indianapolis, Ind., representative of Board of Trustees.

Educational Committee

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G. M. Cover, Case Institute of Technology, Cleveland, '49.
G. R. Fitterer, University of Pittsburgh, '48.
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John F. Kahles, University of Cincinnati, '50.
H. B. Knowlton, International Harvester Co., Chicago, '49.
R. D. Stout, Lehigh University, Bethlehem, Pa., '48.

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Zay Jeffries, General Electric Co., Pittsfield, Mass., '50.
A. W. Mace, Allegheny Ludlum Steel Corp., Washington, D. C., '50.
E. H. Stilwill, Dodge Division, Chrysler Corp., Detroit, '50.
K. R. Van Horn, Aluminum Co. of America, Cleveland, '49.
Clyde Williams, Battelle Memorial Institute, Columbus, Ohio, '48.

Metal Progress Advisory Committee

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W. H. Eisenman, Secretary, A.S.M.
Ray T. Bayless, Assistant Secretary, A.S.M.
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O. W. Ellis, Ontario Research Foundation, Toronto, '50.
Walter Jominy, Chrysler Corp., Detroit, '50.
M. A. Scheil, A. O. Smith Corp., Milwaukee, '49.
C. S. Smith, University of Chicago, '49.
Earle C. Smith, Republic Steel Corp., Cleveland, '48.
Jerome Strauss, Vanadium Corp. of America, New York, '49.

Metals Handbook Committee

(No change in appointments)

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M. G. Fontana, Ohio State University, Columbus, Ohio, '50.
J. H. Hollomon, General Electric Co., Schenectady, N. Y., '49.
H. B. Osborn, Jr., Ohio Crankshaft Co., Cleveland, '48.
W. A. Pennington, Carrier Corp., Syracuse, N. Y., '50.
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E. S. Rowland, Timken Roller Bearing Co., Canton, Ohio, '48.
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Variables in Sheet Steel Stock Cause Forming Difficulties

Reported by A. Waydak
Engineering Department, Chevrolet Motor Co.

Speaking on "Deep Drawing and Forming of Carbon and Stainless Steel", C. B. Allen, metallurgist of the railway equipment division of the Budd Co., substituted for R. W. E. Leiter, chief metallurgist of the new Red Lion plant of the Budd Co., who sustained a fractured ankle three days before he was scheduled to address the November meeting of the Saginaw Valley Chapter.

Factors which cause difficulties in the forming or stamping of parts are poor product and die design and variables in the sheet steel stock, such as variation in grain size, foreign inclusions, stretcher strains and aging.

Too large a grain size, Mr. Allen pointed out, produces an "orange peel" surface, which requires filing and polishing of parts for a good surface. Too small a grain size makes the sheet stiffer, while spotty grain size also produces a poor surface.

Foreign inclusions and surface imperfections (such as foreign particles rolled into the steel) are stress raisers and cause breakage and weakness, said Mr. Allen. Stretcher strains are irregular, raised lines and depressions in the surface, indicating compressive and tensile strains in the steel. These produce a characteristically irregular surface, especially on the straighter portions of stampings.

The regular run of steel used for the majority of stampings tends to age or increase hardness rather quickly, Mr. Allen said. Cold working of steel accentuates this susceptibility to aging. Steel should be used within a week. When the effects of aging show up, roller leveling will restore ductility.

chloride solutions as plating baths; plates could not be obtained at all from solutions of chromic nitrate or perchlorate No difference in plating behavior between the green and violet forms of chromic chloride was observed. 31 ref.

8-166. Der Einfluss der Hartverchromung auf die Dauerfestigkeit von Aluminiumlegierungen. (The Influence of Hard Chromium Plating on the Fatigue Strength of Aluminum Alloys.) Ernst Raub. *Metallforschung,* v. 2, April 1947, p. 121-126.

The fatigue strength of pressed bars of Al-Mg and Al-Mg-Zn alloys, as affected by different surface treatments (including hard chromium plating). The influence of various thicknesses of chromium and of crystal structure on fatigue strength.

8-167. L'Isolement des Conducteurs en Aluminium par Oxydation Anodique. (Insulation of Aluminum Conductors by Anodic Oxidation.) Jean Odier. *Revue de l'Aluminium,* v. 24, Sept. 1947, p. 259-264.

Equipment used to produce flexible conductors (wires and ribbons) which are coated with a layer of aluminum having high dielectric strength. Properties of some commercial wires are given.

8-168. Machine Designed for High-Speed Metal Plating. A. D. Canner, C. Twele, and T. J. Connor. *Materials & Methods,* v. 26, Nov. 1947, p. 79-82.

Unit developed by General Electric eliminates use of large tanks, acids, and motor-generator sets. The entire process takes place in a piece of equipment 5 ft. wide, 4 ft. deep, and 5 ft. high, with service connections for 440-volt a.c. current, 100-lb. air, 50-lb. water, and a liquid drain outlet.

8-169. Electroplating on Aluminum. (Preparation by Zinc Immersion Process.) Myron B. Diggin. *Metal Finishing,* v. 45, Nov. 1947, p. 67-69.

Recipes for surface preparation of the different types of alloys, and for plating with copper, nickel, cadmium, zinc, brass, silver, and chromium.

8-170. Introductory Survey of Electroplating. Rick Mansell. *Metal Finishing,* v. 45, Nov. 1947, p. 70-74.

Basic principles; function of coatings; corrosion protection; electroplating factors; coating properties; bath characteristics; and solution components.

For additional annotations indexed in other sections, see:
27-245-246.

9 PHYSICAL TESTING

9-150. A Nondestructive Magnetic Hardness Tester. W. H. Meiklejohn. *Electronic Industries & Electronic Instrumentation,* v. 1, Oct. 1947, p. 14-15, 45.

General Electric's magnetic hardness tester for production testing of small steel parts.

9-151. Six-Ton Schenck Fatigue Testing Machine. *Headquarters Air Materiel Command Technical Report 5623,* Oct. 1947, 23 p.

Use of the resonance principle in the Schenck (German) fatigue testing machine. Different specimen shapes; procedure for operating the machine and a preliminary SN diagram for S.A.E. 2330 steel under fluctuating tensile and reversed stresses.

9-152. Bend Testing of Armature Binding Wire. *Steel,* v. 121, Oct. 27, 1947, p. 92.

Test procedures for tin-coated wire used at General Electric Co.'s Works Laboratory, Erie, Pa.

9-153. Method of Determining Brittle Strength of Hot Worked Structural Steels. Ia. M. Potak and S. I. Magazanik. *Factory Laboratory (U.S.S.R.),* v. 13, April 1947, p. 463-471. (In Russian.)

The usual methods do not give results indicative of actual conditions leading to structural failure. A satisfactory method was therefore developed which takes into consideration the difference between strength in the normal and tangential directions. Test results on a number of steels showing effects of different heat treating temperatures.

9-154. Method for Testing of Metals by Rolling Wedge-Shaped Specimens. A. I. Chipizhenko. *Factory Laboratory (U.S.S.R.),* v. 13, April 1947, p. 471-475. (In Russian.)

Because of the continuous variation in the width of such specimens, relatively few tests are required to determine the physical and mechanical properties of metals as affected by the degree of deformation. The method and its use on brasses containing different amounts of lead for both cold and hot rolling at different temperatures.

9-155. Determination of Mechanical Properties of the Steel in Completed Structures by Testing of Small Ring-Shaped Specimens. A. N. Mitinskii and Iu. S. Ivanov. *Factory Laboratory (U.S.S.R.),* v. 13, April 1947, p. 475-479. (In Russian.)

Method and equipment for removal of the specimen; its use in determination of properties; use for identification of the type of steel; typical results.

9-156. Effect of Method of Notching of "Menage" Specimens on Impact Testing of Steel. S. E. Beliaev and T. K. Panar'ima. *Factory Laboratory (U.S.S.R.),* v. 13, April 1947, p. 500-501. (In Russian.)

Specimens prepared by three methods. Lowest impact resistances shown for specimens prepared by abrasive-wheel cutting after hot working.

9-157. Device for Adjustment of Specimens During Impact Testing and Results of Test on Displaced Notches. D. M. Zagorodskikh. *Factory Laboratory (U.S.S.R.),* v. 13, April 1947, p. 503-505. (In Russian.)

Simple jig for the above. Results of notch tests on two steels with the notches displaced various small distances from the proper location.

9-158. Repeated-Impact Bending Tests. N. F. Lashko. *Factory Laboratory (U.S.S.R.),* v. 13, May 1947, p. 600-606. (In Russian.)

Results of testing to failure on the Amsler machine of specimens of different steels and aluminum alloys.

9-159. Elongation Curve of Metals Upon Impact. A. Lobko. *Factory Laboratory (U.S.S.R.),* v. 13, May 1947, p. 607-610. (In Russian.)

A method for construction of such curves from experimental data obtained with specimens having a cylindrical section in the center and tapering conically to the two ends, which are of greater diameter than the center. Mathematical relationships are developed and verified, between cone angle, maximum and minimum diameters, and stresses required for beginning of deformation and for failure, respectively, for two steels.

9-160. Volume-Weight Indicator for Estimation of the Plasticity of Sheet Materials. I. M. Roitman. *Factory Laboratory (U.S.S.R.),* v. 13, May 1947, p. 611-617. (In Russian.)

A simple method based on measurement of volumes and weights of tensile specimens before and after testing to failure. Formulas for calculation of "volume-weight indicator" and "coefficient of drawing". Experimental data for a variety of sheet metals.

9-161. High-Speed Impact-Testing Machine for Determination of Bending and Expansion. N. N. Davidenkov and A. V. Noskin. *Factory Laboratory (U.S.S.R.),* v. 13, June 1947, p. 722-729. (In Russian.)

New machine is capable of speeds up to 300 m. per sec. Results on three different alloy steels.

9-162. Method for Determination of Modulus of Elasticity of the Metal in Thin Bimetallic Rings. M. M. Khruschov and M. A. Babichev. *Factory Laboratory (U.S.S.R.),* v. 13, June 1947, p. 729-737. (In Russian.)

A new method and test machine for direct determination without use of specially prepared flat test specimens. Results are of special value for determination of stresses during fatigue testing of steel rings inlaid with antifriction (bearing) metals. Results for a series of bearing metals.

9-163. Methods of Mechanical Testing for Special Saw Steels. E. V. Zotova and A. A. Nefedov. *Factory Laboratory (U.S.S.R.),* v. 13, June 1947, p. 737-740. (In Russian.)

Mechanical properties (tensile strength, Rockwell hardness, and plasticity) do not fully characterize these steels. More reliable results are obtained by less severe methods, especially by torsion testing. Influence of tempering temperature on mechanical properties of a series of saw steels.

9-164. Dilatometric Testing of Thin Specimens Using an Especially Designed Adapter. A. Ts. Spektor. *Factory Laboratory (U.S.S.R.),* v. 13, June 1947, p. 756. (In Russian.)

An adapter which facilitates the test procedure.

9-165. Influence of Method of Notch Preparation on Impact Strength. M. D. Derebizov and G. I. Nazarova. *Factory Laboratory (U.S.S.R.),* v. 13, June 1947, p. 764-766. (In Russian.)

A comparison of different methods. Factors of importance are: whether the notch was prepared before or after heat treating, and whether it was made by cutting or grinding. Differences as high as 3 kg. per sq.cm. were found.

9-166. Charpy and Izod Testing. Part II. C. M. Schwitter. *Product Engineering,* v. 18, Nov. 1947, p. 159-162.

Limits of reproducibility for test results; significance of impact tests, industrial applications.

9-167. Influences de la Forme de L'Eprouvette et de la Vitesse de Mise en Charge sur la Dispersion des Essais de Traction sur Fontes. (Effects of the Shape of the Test Specimen and the Loading Rate on Scatter in Tensile Tests on Cast Iron.) Paul Bastien and Louis Beugras. *Fonderie,* Aug. 1947, p. 751-758.

Tensile-tests reported are compared with results of shear and bending tests on the same types of specimens. The tensile test data are considered to be far more accurate for the determination of the mechanical strength of small cast-iron test specimens than the shear and bending test results.

9-168. Die Verpressbarkeit von Eisenpulver. (Compressibility of Iron Powder.) F. Eisenkolb. *Stahl und Eisen,* v. 66-67, Feb. 27, 1947, p. 78-82.

A new method for the above in which a series of small cylindrical test specimens of exactly the same size and

(Turn to page 26)

Nitrogen Found To Be Cause Of Strain Aging

Reported by F. R. Anderson

Chief Metallurgist, Gardner-Denver Co.

"A spontaneous change in the properties of iron and steel resulting from precipitation of a constituent which is more soluble at a higher temperature than at a lower temperature" was the definition of "aging" given by Samuel Epstein, research department of Bethlehem Steel Co., before the Rocky Mountain Chapter's October meeting. Such precipitation increases strength and reduces ductility, he pointed out.

The "drop of the beam" observed in tensile testing of soft steel (a characteristic ordinarily accepted as inherent in steel) is actually a strain-aging phenomenon, Mr. Epstein continued. Even slight cold work will cause the drop of the beam to disappear, although in aging steel it will return in time after such cold work. In sheet steel for deep drawing the return of the drop of the beam after aging is undesired, since it is accompanied by the defect known as stretcher strains. This accounts in part for the demand for nonaging sheet steel.

Early work pointed to oxygen as the cause of strain aging. The fact that steel strongly deoxidized with aluminum proved to be nonaging appeared to support this theory. However, it was known that aluminum could combine or "fix" not only the oxygen in steel but also the nitrogen. So the question remained whether aluminum was making the steel nonaging because of deoxidation or denitrogenization.

The answer came when Mr. Epstein found that a highly oxidized steel (rimming steel) became nonaging when vanadium was added. This vanadium addition did not interfere with the rimming action, so evidently the steel was not deoxidized. But the steel *was* denitrogenized, the nitrogen being "fixed" as vanadium nitride. This was strong evidence that nitrogen is the cause of strain aging.

A good deal of vanadium-treated nonaging rimming sheet steel is being made. An important advantage is a better surface than aluminum-killed nonaging steel.

The distinction between strain aging and quench aging was explained. Nitrogen is mainly responsible for strain aging and carbon for quench aging. The carbon in the aluminum-killed and in the vanadium-treated nonstrain-aging steels is not fixed—hence they are both still subject to quench aging. Annealing in moist hydrogen removes both nitrogen and carbon and thus eliminates both strain aging and quench aging. The same effect may be had by adding about 0.5% titanium which ties up both nitrogen and carbon. Neither hydrogen-treated nor titanium-treated steel shows a drop of the beam, even in the annealed condition.

W. H. Phillips
1886-1947

Announcement of the sudden death of William H. Phillips, vice-president in charge of sales, Molybdenum Corp. of America, Pittsburgh, came as a sad shock to those attending the annual meeting of the American Society for Metals in Chicago last October. Mr. Phillips was national president in 1933-34, and also was a past chairman of the Pittsburgh Chapter. In memoriam a resolution was passed by the past presidents of the society at their meeting on Oct. 21, reading as follows:

"Resolved—That the Past Presidents of the American Society for Metals, both as a group and as individuals, record their profound regret at the death of Past President William H. Phillips, the loss of whose cooperation and companionship will be keenly felt, and that the Past Presidents extend to Mrs. Phillips and her family their deepest sympathy."

Metallurgy Professorship Endowed at Cornell

An endowed professorship of metallurgical engineering has been established at Cornell University, Ithaca, N. Y., as a result of a gift by Francis Norwood Bard, owner of the Barco Mfg. Co. of Chicago. Mr. Bard made the formal presentation of the $250,000 fund at a dinner in his honor on Nov. 7.

Peter E. Kyle has been appointed first occupant of the chair, and the School of Chemical Engineering has been renamed the School of Chemical and Metallurgical Engineering. The newly established school will offer a five-year course of study leading to the degree of Bachelor of Engineering.

In presenting the fund to the university, Mr. Bard asserted: "If this professorship can produce one or two outstanding brilliant metallurgists of world-wide recognition a generation, it will have accomplished a worth-while task. Let us hope that it will produce one every few years."

Oak Ridge Elects Officers, Hears Ceramist Speak

Reported by Fred W. Drosten

Chemical Engineer, Clinton Laboratories

After one month as an active chapter, members in Oak Ridge, Tenn., held a meeting on Nov. 5 to adopt a constitution, elect officers, and hear H. Z. Schofield, supervisor of ceramic research, Battelle Memorial Institute, present a talk on "Ceramics, Past and Present".

The draft of the constitution was presented by George Adamson, chairman of the constitution committee, and accepted as presented. The nominating committee then presented the same slate of officers as had served during the period of organization. These officers, who were declared unanimously elected, are as follows:

Chairman—Robert W. Coyle of Fairchild's N.E.P.A. plant.

Vice-Chairman—George Adamson, Jr., metallurgist, Clinton National Laboratories.

Secretary—Fred W. Drosten, chemical engineer, Clinton National Laboratories.

Treasurer—Frank J. Lambert of the Carbide and Carbon Y-12 Magnetic Separation Plant.

Executive Committee—Wayne Cockrell and Lawrence K. Jetter of Clinton Laboratories; Walter J. Koshuba, metallurgist at Fairchild's N.E.P.A. plant; E. C. Kirstowsky of the Carbide and Carbon K-25 plant; Ben Kuperstock of the Carbide and Carbon Y-12 plant.

The word ceramics was derived from the Greek word meaning "burnt stuff", Mr. Schofield told the group in introducing his subject. In addition to clayware and silicates, the field of ceramics now embraces also the glass-free, crystalline nonmetallics.

A few oxides have promise for use at very high temperatures, and the list of possible materials is expanded if we include some of the carbides, nitrides and borides. In addition to knowing the strength of these materials at high temperatures, some of the proposed uses require that we learn their resistance to severe thermal shock and their stability in various atmospheres. Graphite, properly protected, may be an important material of the future, Mr. Schofield predicted.

Ceramic coatings are receiving much attention for protecting metals at high temperatures. In this use the presence of glass is not so objectionable, since the metal is the stressed structure, rather than the coating.

weight are compared using a special machine, the pressure in which increases regularly for each specimen tested. The last pressure at which the compressed specimen does not disintegrate is considered as the compressibility.

9-169. Surface Hardness Comparator. *Industrial Diamond Review*, v. 7, Oct. 1947, p. 298.

British-made comparator consists of a plastic holder with nine projecting steel pins of different hardnesses. To determine surface hardness, adjacent pins are rubbed across the surface to be tested until one pin scratches the surface, whereas the other slides.

9-170. Progres dans la Mesure de Frottement Interieur des Métaux et des Alliages au Micropendule de Coulomb. (Progress in Determination of Internal Friction of Metals and Alloys Using Coulomb's Micro-Pendulum Testing Machine.) Christian Boulanger. *Comptes Rendus*, v. 225, Oct. 13, 1947, p. 624-626.

Modifications in the machine made during research on internal friction of metals and alloys. These made it possible to determine decrements of less than 0.0001 under stresses of several kg. per sq.mm.

9-171. L'Essai de Fatigue Sous Charge Progressive. (Fatigue Tests Under Progressive Load.) Marcel Prot. *Comptes Rendus*, v. 225, Oct. 20, 1947, p. 669.

Shows by theoretical considerations and experimental data that when fatigue testing is conducted with the stress increasing directly with time throughout the test, instead of with constant stress, the stress at failure will be equal to the time times a constant for the particular specimen. Plotting stress at moment of rupture vs. square root of the coefficient of increment results in an almost straight line whose intersection with the stress axis determines the fatigue stress.

9-172. Methods Used in the Preparation of Test Specimens. (Continued.) G. L. Smith. *Sheet Metal Industries*, v. 24, Nov. 1947, p. 2245-2247, 2262.

Notched-bar (Izod) test pieces; modified British Standard 18 test pieces from strip; miniature test pieces for high-temperature tensile tests; collar-type creep-test pieces for use with tension extensometer; miniature test pieces for tensile tests; and British Standard 18 strip test pieces from tubing. (To be continued.)

For additional annotations indexed in other sections, see:
3-351-362-363-370-377-378; 8-158; **14**-328; **21**-103; **22**-645-646-649; **27**-247.

10 ANALYSIS

10-192. Quantitative Analysis of Mixed Powders With the Geiger-Counter X-Ray Spectrometer. Zigmond W. Wilchinsky. *Journal of Applied Physics*, v. 18, Oct. 1947, p. 929.

Outlines simple technique.

10-193. Quantitative Analysis With the X-Ray Spectrometer. John C. Redmond. *Analytical Chemistry*, v. 19, Oct. 1947, p. 773-777.

Methods used in the author's laboratory for specimen preparation and preparation of quantitative curves. Semiquantitative and quantitative analysis of mixtures of heavy-metal carbides.

10-194. Fluorometric Determination of Microgram Quantities of Boron. Charles E. White, Alfred Weissler, and David Busker. *Analytical Chemistry*, v. 19, Oct. 1947, p. 802-805.

New, highly sensitive quantitative method is based on the intensity of greenish-white fluorescence obtained upon addition of benzoin, in slightly alkaline 85% ethanol solution. Intensity of fluorescence is shown to be a linear function of boron concentration from 0 to 10 micrograms, in a volume of 50 ml. Accuracy is 1 or 2 parts per hundred. It has been applied successfully to determining a few thousandths of 1% of boron in steel. 17 ref.

10-195. Rapid Determination of the Calcium Content of Lead-Calcium Alloys by Titrating in the Molten State With Metallic Antimony. G. M. Bouton and G. S. Phipps. *Electrochemical Society Preprint 92-13*, 1947, 7 p.

Simple method is based on the quantitative removal of calcium by interaction with antimony and an end-point indicated by the surface appearance of test ingots. The method is applicable to lead alloys containing from 0.005 to at least 2% calcium in the range up to 0.11%. Precision is $\pm 0.002\%$.

10-196. Nondestructive Method for Analysis of Ferrous, Nonferrous, and Precious Metal Alloys. N. A. Tananaev. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 389-399; discussion, p. 399-403. (In Russian.)

A quantitative spot test technique for which an accuracy of 0.05 to 0.1% is claimed for quantities under 1%. In discussion, the editor doubts that such accuracy can be obtained.

10-197. "Drop-Time-Measurement" Method of Potentiometric Titration. Part II. A. K. Kal'e. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 413-416. (In Russian.)

New technique for potentiometric titration of silver, zinc, cadmium, copper, and lead.

10-198. Use of Methylviolet in Quantitative Determination of Zinc in Iron Ores. M. A. Popov. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 416-420. (In Russian.)

Details of colorimetric procedure.

10-199. Carbon Detection by Means of the "Steeloscope". N. S. Sventitskii and K. I. Iaganov. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 434-437. (In Russian.)

Determination or identification by a spectroscope with high energy of excitation which permits investigation of the doublet at 4267A.

10-200. Investigation of the Interactions of the Components of Tin Bronzes in the Condensed Spark Spectrum. E. I. Vorontsov. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 438-441. (In Russian.)

Effects of variations in the content of tin, zinc, and lead on the intensity of the principal spectral lines were determined using 25 different standard tin bronzes.

10-201. Spectroscopic Determination of Small Amounts of Boron, Vanadium, Titanium, and Aluminum in Steel. N. V. Byianov, A. V. Lutsenko, and N. N. Sorokina. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 447-451. (In Russian.)

Development of a method using a high-voltage a.c. arc.

10-202. Determination of Small Quantities of Antimony in Nonferrous Metals and Alloys Containing Less Than 0.5% Tin. S. A. Filippov and V. F. Vetoshkin. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 485. (In Russian.)

Method is based on coprecipitation of antimony with metastannic acid followed by titration.

10-203. Potentiometric Determination of Cadmium in Commercial Products. M. G. Berkovich. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 486. (In Russian.)

Modification of a method previously reported by Berg and Wurm (Germany, 1927) and its application to copper-cadmium smelter cakes, Cottrell-precipitator dusts, etc.

10-204. Application of Organic Ion-Exchange Materials in Analytical Chemistry. Part I. Iu. Iu. Lur'e and N. A. Filippova. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 539-547. (In Russian.)

Experiments show 40-fold enrichment of dilute solutions of salts of Ni, Cu, and Co by use of an ion-exchange resin made by condensing resorcinol, sodium sulphate, and formaldehyde. Experiments on quantitative separation of amphoteric metals from anions and nonamphoteric metals.

10-205. Determination of Small Quantities of Arsenic by Reduction With Metals. M. T. Kozlovskii, R. Z. Vagapova, and N. N. Zavalishcheva. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 549-554. (In Russian.)

Effects of different factors on the completeness of reaction with sodium amalgam and with aluminum. Results indicate a maximum of 95% reaction, but more complete and predictable results than with zinc (Marsh test), using sodium amalgam. 22 ref.

10-206. Electrometric Method for Determination of Nickel and Cobalt in Ores. S. K. Chirkov. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 558-564. (In Russian.)

Method is based upon measurement of variations in the potential of bimetallic electrode pairs in solution during titration. Curves show the effects of different electrode pairs on determinations of each of the above elements in either the presence or absence of the other, and of the two combined, in either presence or absence of manganese.

10-207. Photocolorimetric Determination of Phosphorus and Silicon in Ferrous Metals. E. I. Fogel'son and F. S. Kazachkova. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 565-568. (In Russian.)

Results obtained with a photocolorimeter made in Russia and with the Fisher electrophotometer (U. S.) on a series of cast irons and steels. Preparation of the solutions and evaluation of the instruments.

10-208. Application of a Polarographic Method for Determination of Copper and Iron in Crude and in Cathode Nickels. I. A. Korshunov, L. N. Sazanova, and M. K. Shchennikova. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 569-571. (In Russian.)

Method using a dropping-mercury electrode and a visual polarograph.

10-209. Determination of Zinc and Cadmium in Ores and Rocks Under Field Conditions. M. A. Popov. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 618-619. (In Russian.)

Sensitive colorimetric spot test for determining both elements in the same solution, without separation.

10-210. Determination of Free Metal in Slags From Refining of Scrap Aluminum. A. D. Maiants. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 619-620. (In Russian.)

Two methods, one based on chemical reduction, the other on melting with addition of fresh flux and weighing of the obtained "secondary slag". The second method is simpler and the error is only 1.5 to 2.0%, since only an insignificant amount of free metal remains in the "secondary slag".

10-211. Determination of Lead in Steels by a Polarographic Method. Z. S. Mukhina. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 620-621. (In Russian.)

A comparison of two polarographic methods (using 6*N* HCl and 12% H_3PO_4), with the molybdate method. Equally satisfactory results are obtained with all three methods.

10-212. Photo-Electric Method for Determination of Aluminum in Steel. T. P. Temirenko. *Factory Laboratory*

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Hardenability Test Conducted Before Puget Sound Meeting

Reported by J. W. Sweet

Chief Metallurgist, Boeing Aircraft Co.

The actual performance of a Jominy end-quench hardenability test was witnessed by members of the Puget Sound Chapter on Oct. 15. The necessary equipment (a small furnace, Jominy test apparatus, and a Rockwell hardness tester) was moved into the Washington Athletic Club for the demonstration. The test was conducted by Leon N. Olberg, metallurgist for Western Gear Works, Seattle.

While preparing for the test, Mr. Olberg distributed a number of Bethlehem hardenability calculators among the members and outlined the method of using the calculator. A steel analysis was assumed and its D_1 value was calculated. From the carbon content and D_1 value the hardenability curve was plotted on a blackboard. Mr. Olberg pointed out that the conformance of this method to the actual quench test is surprisingly good. He then described the practical application of these hardenability curves to design and production.

After the test specimen had been quenched and allowed to cool sufficiently, hardness readings were taken at 1/8-in. intervals and the hardenability curve plotted. From the shape of the curve it was concluded that the steel was an alloy (carburizing grade) with approximately 0.20% carbon. The speaker pointed out that the carbon content of a steel can be determined with reasonable accuracy by taking the hardness at 1/8 in. from the quenched end on the Jominy bar and then finding the carbon content for the respective hardness on a hardenability calculator.

Jominy test bars can be tempered after quenching at increasingly higher temperatures and curves plotted at each of these temperatures. These data can then be used to predict the hardness at various sections of a part when tempered at any desired temperature. A set of curves is used to determine the relation between the Jominy specimen and the quenching medium.

Foley Speaks at Ontario

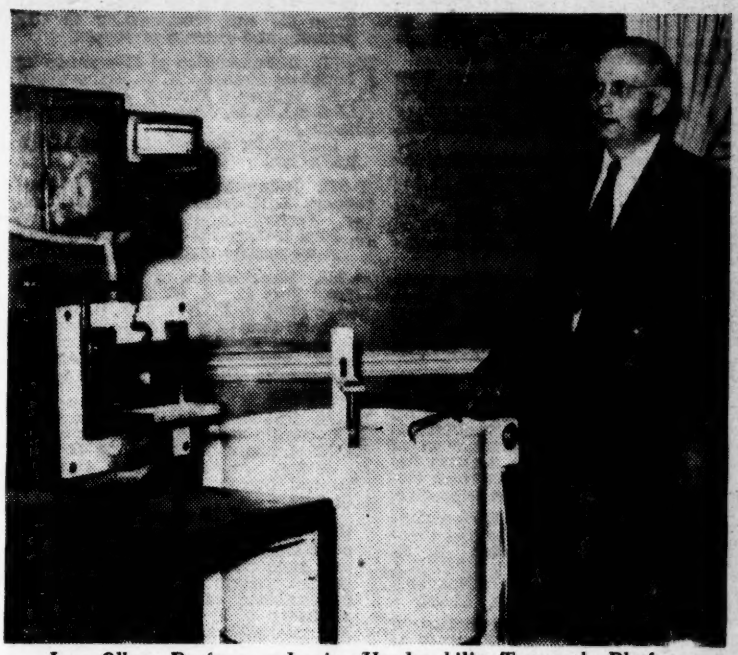
Reported by W. R. Jackson

Carboloy Div., General Electric Co., Ltd.

Francis B. Foley, director of research, Midvale Co., and national president, presented an extremely interesting address to the members of the Ontario Chapter on Oct. 3 on the general subject of "Steel".

Mr. Foley's lecture in the main was a historical review of the metallurgy of iron and steel. In closing, a few references were made concerning future development, particularly the use of oxygen in steelmaking.

Jominy Test Demonstration



Leon Olberg Performs a Jominy Hardenability Test on the Platform Before Members of the Puget Sound Chapter at the October Meeting

Microstructure Correlated With Hardenability and Physical Properties

Reported by Joseph C. Selby

Steel & Tube Division
Timken Roller Bearing Co.

Speaking on heat treating and hardenability before the Canton-Massillon Chapter on Oct. 13, J. M. Hodge, research associate of Carnegie-Illinois Steel Corp., discussed mainly the factors controlling microstructure and the relationship between microstructure and physical properties, especially ductility. He first illustrated by means of slides the possible control of microstructure by cooling rates, based on TTT-curves, and showed the microstructures which can be obtained.

He then gave a short discussion of the properties of each of these structures and of mixtures of the various structures, pointing out the present lack of knowledge concerning certain mixtures. The properties under discussion were toughness, machinability and fatigue life.

The microstructure which gave the best results for each property was pointed out, and physical property charts were shown illustrating the change in properties with change in structure.

Mr. Hodge concluded his talk with a summary of the need for various structures, emphasizing the importance of knowing whether or not full hardenability is necessary, since this is a measure of the extent of alloy additions required.

O. J. Horger, newly elected chairman of the chapter, presided at the meeting.

Describes Atmosphere Generators & Controllers

Reported by Howard J. Godfrey

Assistant Chief Development Engineer
John Roebling's Sons Co.

The subject of "Controlled Atmospheres" was presented from the practical point of view by Henry M. Heyn of the Surface Combustion Corp. before the Philadelphia Chapter, Oct. 31.

Without involving the complexities of the phase rule, the speaker emphasized that furnace atmospheres can be adequately controlled by a dew point recorder. The function of the gas generator was described and the relationship between the proper gas analysis and carbon content of the steel was illustrated.

At the dinner preceding the meeting the oldest living member of the A.S.M., "Uncle" George Metzger, was presented with a silver certificate by Chapter Chairman Howard H. Casey, Jr. "Uncle" George, who started as a messenger boy with Henry Disston in 1870, was 90 years young on Sept. 6 of this year. In 1875 he was apprenticed as a blacksmith and worked up through helper, blacksmith and finally head blacksmith. Mr. Metzger retired on Jan. 1, 1947, after 77 years of continuous service with Disston.

(U.S.S.R.), v. 13, May 1947, p. 621-623. (In Russian.)

Method utilizing a photo-electric colorimeter. The analysis is preceded by separation of iron using the dropping-mercury cathode. 11 ref.

10-213. Determination of Silicon With the "Steeloscope". N. S. Sventitskii and M. F. Fedorov. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 626-628. (In Russian.)

The spectroscopic determination, including the relative intensities of the various lines and their applicabilities for analysis of different steels, cast irons, and nonferrous and light alloys. Details of a.c. generator and arc circuits.

10-214. Application of the A.C. Arc With Magnetic Extinction as a Light Source for Spectral Analysis With the "Steelometer". P. F. Lokhov. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 628-630. (In Russian.)

The circuit for the above permits rapid transition from one means of operation to the other. Comparative results of chemical and spectroscopic analysis for small concentrations of Mo, Mg, Cr, W, and Ni. Analysis using the usual apparatus for these elements is said to be almost impossible.

10-215. Influence of Hydrogen-Ion Concentration on the Colored Complex Compounds Used in Colorimetry. A. K. Babko. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 645-655. (In Russian.)

A series of specific cases. 11 ref.

10-216. Colorimetric Determination of Tungsten in Ores in the Presence of Arsenic, Antimony, Molybdenum, Titanium, and Phosphorus. F. A. Fer'ianchich. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 668-676. (In Russian.)

Proposes a new reaction based on the reduction of the complex of tungstic and thiocyanic acids by trivalent titanium. Test results indicate applicability to 0.003 to 1.5% W, in ores containing up to 10% As; up to 3 to 6% Sb; up to 0.5 to 3% Mo; up to 0.3% Cr; and up to 0.1% V, Se, or Te. The presence of traces of F, Ti, P, Cb, Ta, Cu, and precious metals (except rhenium) does not interfere. 11 ref.

10-217. Concerning the Possibility of Colorimetric Determination of Molybdenum and Tungsten in the Presence of Nitrates and Nitrites. O. A. Songina and M. T. Kozlovskii. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 677-678. (In Russian.)

Nitrate ion does not interfere with colorimetric determination of Mo and W by lead chloride and thiocyanates of the alkali metals. The presence of nitrites in amounts above 4 mg. per ml. makes the determination impossible.

10-218. Precipitation of Tungsten Ion by Means of Sulfamido-2, 4-Diaminoazobenzene (Red Streptocide). V. V. Fomin, V. V. Shaliagin, and V. G. Starostina. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 679-680. (In Russian.)

Use of the above compound for precipitation of tungsten or molybdenum from solutions of their salts. Tungsten only may be precipitated by using reagent dissolved in concentrated HNO_3.

10-219. Qualitative Determination of Vanadium. M. A. Popov. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 680-682. (In Russian.)

Existing methods with emphasis on the use of alpha-naphthylamine under certain conditions which permit detection of 1 part in 25,000.

10-220. Consecutive Determination of Manganese and Nickel or Chromium and Nickel in Steels Using One Sample. A. G. Bogdanchenko. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 748-751. (In Russian.)

One of the principal modifications of a well-known method is the use of a specific amount of $AgNO_3$ solution as catalyst for oxidation of Mn and Cr, which solution later serves as indicator during titration of nickel. Procedures for each combination in the presence and absence of copper.

10-221. Determination of Manganese by a Periodate Method. K. N. Ershova and G. N. Volkova. *Factory Laboratory (U.S.R.R.)*, v. 13, June 1947, p. 751. (In Russian.)

Method for steels containing 0.17 to 0.65% Mn.

10-222. Determination of Boron in Ferroboron. L. E. Sabinina and T. V. Stiunkel'. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 752-753. (In Russian.)

A volumetric method using $Ba(OH)_2$.

10-223. Identification of War Steel Bar Stock. Part II. A. W. Ehlers. *Tool & Die Journal*, v. 13, Nov. 1947, p. 74-77.

Spot tests for nickel, chromium, tungsten, molybdenum, and stainless steel. Procedures using the magnetic comparator and the cathode-ray oscilloscope.

10-224. The Determination of the Gases in Meteoritic and Terrestrial Irons and Steels. Leonard K. Nash and Gregory P. Baxter. *Journal of the American Chemical Society*, v. 69, Oct. 1947, p. 2534-2544.

No method is completely satisfactory, but solution with aqueous mercuric chloride is the best, and method may yield good results for steels which do not contain too large a quantity of combined carbon. The essential similarity of the gases in terrestrial and meteoritic steels. 43 ref.

10-225. Absorption Spectrochemical Analysis in the Ultraviolet Region of the Spectrum. Iu. Ia. Mikhailenko. *Progress in Chemistry (U.S.S.R.)*, v. 16, July-Aug. 1947, p. 443-460. (In Russian.)

A review. 226 ref.

10-226. An Automatic Arc-Current Regulator. E. V. Potter and Arden Scott. *Review of Scientific Instruments*, v. 18, Oct. 1947, p. 722-726.

Standard curves obtained using the regulator are more regular and reliable, and individual points can be reproduced more closely than those from an uncontrolled arc. Analyses can also be reproduced more closely, and results are in better agreement with chemical analyses than those obtained with the uncontrolled arc.

10-227. Automatic Recording of Titrations. J. M. Gonzalez Barredo and John Keenan Taylor. *Electrochemical Society Preprint 92-26*, 1947, 8 p.

One source of error in volumetric analysis is the exact measurement of the volume corresponding to the equivalence point. New method removes this difficulty and substitutes an automatic measurement of time for the direct measurement of volume. Applications to electrometric titrations and to those in which the endpoint is indicated by a change in adsorption of radiant energy.

10-228. Remarques sur le Dosage de l'Uranium par la Methode d'Auger. (Remarks Concerning Determination of Uranium by Auger's Method.) Georges Weiss and Pierre Blum. *Bulletin de la Société Chimique de France*, v. 14, July-Aug. 1947, p. 735-737.

Results of a potentiometric study of the process of oxidation of tetravalent uranium to the hexavalent state, using ferric ion. Conditions under which this method may be used for uranium determination. Confirmation of Auger's conclusions is indicated. The role of ammonium sulphocyanide as an indicator.

10-229. Uziti Spektralniho Rozboru v Hutnictvi. (Application of Spectrographic Analysis in the Metals Industry.) A. K. Pokorny. *Hutnické Listy*, v. 2, Sept. 1947, p. 51-57.

Some of the methods in use and practical examples such as in ore testing, raw-material control, tapping control.

10-230. Le Dosage Spectrographique de l'Alumine dans les Résidus d'Oxydes Métalliques. Application au Dosage de l'Oxygène dans les Aciers Spéciaux. (Spectrographic Determination of Aluminum in Metallic Oxide Residues. Application of This Method for Determination of Oxygen in Special Steels.) René Castro and J. M. Pheline. *Comptes Rendus*, v. 225, Oct. 13, 1947, p. 633-635.

How oxygen in steel may be isolated by addition of aluminum to liquid steel. The aluminum oxide found is then separated by an appropriate chemical method, resulting in a residue of alumina. The spectrographic method is recommended for the determination of the small amounts of aluminum present, from which the oxygen content may be readily calculated.

10-231. Determination of Silver and Copper in One Sample of Plating Solution. Louis Silverman. *Metal Finishing*, v. 45, Nov. 1947, p. 80-82.

Modified procedures which are claimed to improve the speed and accuracy of Mott's iodide-titration method for copper in cyanide and acid plating solutions. Titration procedure for silver and copper in one sample.

For additional annotations indexed in other sections, see:
1-137.

11 INSTRUMENTS
Laboratory Apparatus

11-174. Electron Microscopy. R. A. Scott. *Science Progress*, v. 35, Oct. 1947, p. 638-651.

Technique, including interpretation of results.

11-175. Automatic Ignition Cycle Simplifies Die-Cast Metal Production. Robert Miller. *Industrial Heating*, v. 14, Oct. 1947, p. 1615-1616, 1642.

Use of control system.

11-176. Furnace Atmospheres for Sintering. (Concluded.) Part IV: Gas Analyzers. H. M. Webber and A. G. Hotchkiss. *Industrial Heating*, v. 14, Oct. 1947, p. 1618, 1620, 1622, 1654, 1656.

Various types of analyzers and their advantages and disadvantages for use in the control of sintering atmospheres.

11-177. Spectrographic Slag Control. *Industrial Heating*, v. 14, Oct. 1947, p. 1661.

Review of paper by J. W. Woodruff presented at 30th Annual Open Hearth Conference of the A.I.M.E.

11-178. Macro-Etching and Photomacrography of Ferritic and Austenitic Welded Joints in Low-Alloy Steel. O. O. Miller and E. G. Houston. *Welding Journal*, v. 26, Oct. 1947, p. 620s-625s.

Procedures are designed to show the position, size, and macrostructure of weld metal in the several passes and to indicate the various macrostructural zones of the heat-affected region of base metal. Emphasis is placed on light macro-etching of a highly polished surface. A procedure for photographing fractured surfaces. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

11-179. Measuring by Electron Microscopy. E. F. Fullam. *General Electric Review*, v. 50, Oct. 1947, p. 18-21.

Methods for calibrating magnification and correcting image distortion, essential factors in obtaining accurate measurements with the electron microscope. 14 ref.

(Turn to page 30)

Unusual Metals Satisfy Demands For Strength at Heat

Reported by Robert T. Hook

Warner & Swasey Co.

The broad scope of nonferrous metallurgy with all the permutations possible from over 60 metallic elements was mentioned as a background for a general talk on "Recent Advances in Nonferrous Metallurgy" presented by Bruce W. Gonser of Battelle Memorial Institute before the Cleveland Chapter on Nov. 3.

Discussing briefly the finding and recovery of metals Dr. Gonser paid particular attention to unusual methods of concentration. Concentration of specific metal salts in plants and animal life, as well as in brines, the ocean floor, river valleys, and mineralized areas, points to possibilities for making scarce metals more easily available. Prices of some of the unusual metals and the reasons for their scarcity or lack of applications were given.

The growing demand for metals and alloys with high strength at very high temperatures, and for high-temperature oxidation resistance, is an important factor in the increased attention being given to the unusual metals, Dr. Gonser said. Modern demands have outrun the properties of the well-known materials of construction in many instances and the metallurgist is being called upon to produce and protect metals and alloys endowed with properties that would have seemed almost fantastic a few years ago.

The probable future importance of titanium and zirconium was particularly emphasized because of their excellent properties and relative potential abundance. Tantalum, molybdenum and tungsten, with their extremely high melting points, are becoming increasingly useful. Development work among alloys of these metals is among the most interesting of current researches, in Dr. Gonser's opinion.

Recovery of some of these uncommon metals from their ores has involved a type of chemical engineering metallurgy that is much different from carbon reduction. Familiarity in the use of vacuum and of hydrogen, helium, argon and other protective atmospheres is growing. The decomposition of volatilized halide salts of many of the uncommon metals is becoming a useful means for their recovery or for plating them onto base metals.

Among various useful current developments are copper alloys of improved high strength plus high conductivity, aluminum-coated steel products, refrigeration to make easily melted alloys rigid for use in dies, and use of carbide rolls to impart an improved surface and permit the rolling of hard metals to extreme thinness.

For the coffee talk Coach Ray Ride of Case Institute of Technology showed movies of the Case-Carroll game.

Chicago Chapter Booth Sells 30 Memberships

In the Booth Sponsored by the Chicago Chapter During the Recent National Metal Exposition Are (Left to Right): John Hannon, Lloyd Bohan, Billy Williams and Andrew A. Engelhardt. The chapter celebrated its 30th anniversary during the Exposition, and, appropriately, 30 new members were enrolled at the booth. (Photograph by Claud S. Gordon)

Divergent Performance Of Equivalent Steels Traced to Heat Treatment

Reported by Frank Kristufek

U. S. Steel Corp. Research Laboratories

Among the first to recognize that similar mechanical properties can be obtained in alloy steels of varying composition by heat treatment were Janitzky and Baeyertz, according to H. J. French of the International Nickel Co., Inc., who spoke on "Alloy Steels and Their Heat Treatment" at the October meeting of the New Jersey Chapter. A paper presented by these investigators in 1939 focused attention on this phase of metallurgy by demonstrating how a marked similarity in tensile properties of several S.A.E. steels could be obtained by heat treatment.

However, further work has shown that the different alloy steels, which display similar tensile properties when tested under certain conditions in small sections, are really not at all alike in other respects which may become important in practical use. Divergent performance may be shown at a given range of full hardness or after tempering to a lower level of hardness depending upon whether the steel was quenched entirely to martensite or whether it partially transformed during quenching.

With the aid of slides, Mr. French presented data illustrating the effect of various types of heat treatment on the mechanical properties of a variety of low-alloy steels, which indicated that such steels, when quenched entirely to martensite and tempered, show superior notch toughness over similar material heat treated by other methods.

British test data were presented showing that slack quenching, which produces complex structures including bainite formed at high temperatures, results in mechanical properties inferior to those of fully hardened and tempered steels, such as lower elastic properties with lower ductility in tensile tests, low impact values and low fatigue limits.

In contrast to the inferiority of structures containing bainite formed at high temperatures, the process of austempering, which gives low-temperature bainite, can result in improved ductility and notch test values at high hardness. However, the effectiveness of austempering is restricted to parts of small size.

Mr. French also stressed the value of notched-bar tests in defining the effects of low temperature.

11-180. Humidity Measurement by a New System. W. F. Hickes. *Refrigerating Engineering*, v. 54, Oct. 1947, p. 351-354, 388.

Instrument called the "Dewcel" consists essentially of a temperature-sensitive winding contained in a stainless-steel tube carrying a lithium-chloride-impregnated glass wick and silver conductors. Various advantages and potential applications, for instance controlling the moisture content of blast-furnace air supply.

11-181. Bore-Diameter Checking Method. C. H. Borneman. *Machinery*, v. 54, Oct. 1947, p. 182.

Instrument for checking bore diameters in long cylinders described in the Dec. 1945 issue gives readings that are somewhat inaccurate.

11-182. A Technique for Estimating Precision of Measurement. Fred Trowbridge. *Instruments*, v. 20, Oct. 1947, p. 959-960.

Statistical technique for evaluating the precision of a measuring setup.

11-183. Applied Photography. James F. Driver. *Machinery Lloyd (Overseas Edition)*, v. 19, Oct. 11, 1947, p. 68-71.

Application to all sorts of problems such as motion study, photo-elastic analysis, radiography, television, spectrography.

11-184. Technical Data on Electronic Micrometer. *Electronics*, v. 20, Nov. 1947, p. 172, 174, 176, 178, 180.

Instrument with accuracy of better than 0.00005 in., developed by Bureau of Standards for measuring thickness of insulation on metal surfaces.

11-185. Separation of Nonmetallic Inclusions From Stainless and Acid Resistant Steels. S. I. Malov. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 492-494; discussion, p. 494. (In Russian.)

Recommends an acid solution method rather than the customary electrolytic solution method, since carbides are said to be completely destroyed, and silicates partially, by the latter method. Data on the content and composition of inclusions in three Soviet steels. Editor's note doubts efficacy of method.

11-186. Etching of Metallographic Specimens by Heating. A. Ts. Spektor. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 630-631. (In Russian.)

Simple method involving heating until color begins to appear, followed by quenching, brings out the contrast between the ferrite and cementite zones of steel.

11-187. "Surface Analyzer" for Estimation of Roughness. M. M. Tennenbaum. *Factory Laboratory (U.S.S.R.)*, v. 13, May 1947, p. 635-637. (In Russian.)

Motion of a needle point over the surface of the specimen is amplified by two piezo-elements and recorded graphically by a moving pen. Curves produced by the instrument and true surface profiles are presented in pairs for several types of surfaces. Reason for differences is explained on the basis of the finite dimensions of the needle point.

11-188. Electrodynamic Coercimeter. M. A. Grabovskii. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 702-707. (In Russian.)

A new apparatus for rapid determination of the Curie point of ferromagnetic materials. Comparison with the usual method. Accuracy is 2 to 3% and time required is 30 to 45 sec.

11-189. Method for Determination of Changes in Length at High Temperatures. I. Ia. Zalkind, A. V. Anan'in, and P. N. Manuilov. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 707-709. (In Russian.)

New apparatus and method is very simple in construction and permits automatic recording of length changes corresponding to temperature changes up to 1200° C. Operation is by a combination of pneumatic, mechanical, and electrical systems.

11-190. Cathode-Ray Recording Micrometer and Force Gage. J. Ewles and C. Curry. *Journal of Scientific Instruments*, v. 24, Oct. 1947, p. 261-265.

Device uses a cathode-ray oscillograph in connection with a moving-coil system to record and measure rapidly varying movements of the order of 3 mm. to an accuracy of 0.0025 mm. by attaching the moving coil to a specially designed force gage of natural period of about 0.0002 sec. The device was used to record and measure rapidly varying forces and in a preliminary study of rapid shear.

11-191. A Simple Scanner for X-Ray Diffraction. Robert H. Hay. *Review of Scientific Instruments*, v. 18, Oct. 1947, p. 801-802.

Simple yet effective scanner which fits directly onto the track of the General Electric XRD unit. The device is especially useful for superimposing on one film the patterns from many grains in metallic samples.

11-192. Limits of Precision in the Determination of Lattice Parameters and Stresses by the Debye-Scherrer Method. Hans Ekstein and Stanley Siegel. *National Advisory Committee for Aeronautics Technical Note No. 1375*, Oct. 1947, 24 p.

The spectral width of the characteristic radiation is the limiting factor when the geometric line width has been sufficiently reduced. The intensity distribution in the line is calculated for the case of sufficiently large perfect crystal grains, negligible geometric width, and uniform angular distribution of the grains. Experiments were performed with copper radiation on zinc samples. Photographs taken with samples of different crystal grain sizes show the transition from the jagged to the theoretical, smooth intensity curve.

11-193. High-Speed Movies Trace Cause of Wear. *Machinery*, v. 54, Nov. 1947, p. 164.

Four frames show how indexing pawl rebounded from ratchet-wheel tooth before coil spring restored contact, resulting in rapid wear.

11-194. Photographing Cooling Curves of Hardening Oils by Means of a Cathode-Ray Oscillograph. *Philips Technical Review*, v. 9, no. 5, 1947, p. 147-148.

In attempting to compound a quenching oil having more satisfactory properties than colza oil and mineral oil, it was necessary to develop a method for studying the course of the cooling process. Use was made of a solid silver ball 20 mm. in diameter, containing a thermocouple to which the heat of the silver is well conducted. The ball is heated to about 800° C., and then immersed in the oil to be tested. Temperature recording over the extremely short times involved is done by visually recording the e.m.f. of the thermocouple on the screen of a cathode-ray oscillograph and photographing the picture. (Based on paper by B. Levy, *Electronic Measuring*, v. 1, no. 4, 1946.)

11-195. Acceptance Sampling by Variables, With Special Reference to the Case in Which Quality Is Measured by Average or Dispersion. John H. Curtiss. *Journal of Research of the National Bureau of Standards*, v. 39, Sept. 1947, p. 271-290.

Theory and practice of certain types of acceptance-sampling plans based on statistical tests of hypotheses. Basic concepts are discussed in detail, and then applied to obtain a number of specific formulas for the single sampling case.

11-196. Progress in Industrial Instrumentation. G. W. Tall, Jr. *Engineers' Digest (American Edition)*, v. 4, Oct. 1947, p. 450, 492.

A general discussion.

11-197. Testing Circular Division With Precision Polygons. C. O. Taylerson. *Machinery Lloyd (Overseas Edition)*, v. 19, Oct. 25, 1947, p. 68-72.

An optical method for testing the accuracy of the circular scales of engineers' angular measuring instruments such as dividing heads, and tables.

11-198. Variable-Frequency Metals Comparator. D. E. Bovey. *General Electric Review*, v. 50, Nov. 1947, p. 45-49.

Apparatus for rapid checking of both magnetic and nonmagnetic materials for hardness, composition, or heat treatment at frequencies from 50 to 10,000 cycles per second.

For additional annotations indexed in other sections, see:
4-189; 6-292; 7-410.

116 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

12 INSPECTION AND STANDARDIZATION

12-196. Internal Gaging With Two-Point Measuring Devices. H. Flury. *Microtecnic*, v. 1, Aug. 1947, p. 83-84. (English section.) (For figures see French section, p. 189-191.)

Instruments and technique. (Translated from the German.)

12-197. Commercial Castings—Plea for Quality Control. *Light Metals*, v. 10, Oct. 1947, p. 539-541.

Comparative surface quality of aluminum alloy castings finished by the various commercial methods. Differences between wrought and cast forms.

12-198. Control of Permanent-Magnet Alloy Quality. J. D. Seaver and R. E. Anderson. *General Electric Review*, v. 50, Oct. 1947, p. 44-47.

Method for maintaining the magnetic quality of small heats, equipment used, technique applied, and operating performance.

12-199. Comment on Article "A Comparison of Low-Pressure Vessels Constructed in Compliance With Different Codes or Regulations". R. K. Cadwell. *Welding Journal*, v. 26, Oct. 1947, p. 906, 922.

Discussion of article by R. E. Cecil, in May issue.

12-200. Mobile Laboratory Measures Surface Finish in the Shop. A. A. Goodman. *American Machinist*, v. 91, Oct. 23, 1947, p. 104-106.

Use of mobile surface-finish analyzer by steam division of Westinghouse. All necessary instruments and accessories are kept in a cabinet built into the unit which is moved about like a hand truck.

(Turn to page 32)

Temperature and Inclusion Control Important in Melting for Steel Casting

Reported by Hugh A. Springer

Metallurgist, Sheffield Steel Corp.

The two most important phases in melting for steel castings are temperature control and inclusion control, said G. A. Lillieqvist, director of research for American Steel Foundries, whose subject before the Kansas City Chapter ⚙ on Oct. 15 was "Melting Practice for Steel Castings".

Temperature control has an important effect on fluidity in pouring steel castings, and Dr. Lillieqvist presented slides picturing molds for a spiral fluidity test. He also pointed out that there is a straightline relationship between temperature and fluidity. The technique used in performing any kind of a test in foundry work must be standardized so that correlations may be made between test results and the casting poured.

Deoxidation is of primary importance in the manufacture of steel castings for the elimination of "pinhole" porosity and the control of inclusions; these in turn affect the physical properties of the castings.

A series of slides presented graphically the effect of varying aluminum additions from 0 to 2½ lb. per ton of charge, on the elongation and reduction in area of standard test specimens. The crystalline type of inclusion which is formed from good deoxidation practice is by far the least detrimental, Dr. Lillieqvist said. Higher grain-coarsening temperatures result from aluminum additions of 2½ lb. per ton of charge, and the heat treating range for similar physical properties is thereby increased.

Iron oxide content in the slag of basic openhearth furnaces and its effect on inclusions were discussed. Pancake tests are used to keep the iron oxide between 13 and 15% with the lime-silica ratio 3.0 to 3.5.

Quality control charts are used in openhearth shops as an aid in the control of carbon, phosphorus and sulphur. X-ray inspection of steel castings is increasing, accompanied by more accurate interpretation of results.

G. A. Lillieqvist (Left), Speaker at the October Meeting of the Kansas City Chapter, Shown With Henry Deterding, Chapter Vice-Chairman

Jominy Chart Projections Show Martempering Limits

Reported by Floyd B. Allen

Tool Engineer, Remington Rand, Inc.

Substituting for B. F. Shepherd, chief metallurgist, Ingersoll-Rand Co., who was unavoidably prevented from attending, A. O. Crobaugh presented a talk on "Martempering" with excellent slides and a discussion that would do credit to Mr. Shepherd, who originated the martempering process. Mr. Crobaugh, who is metallurgist for the compressor division of Ingersoll-Rand, addressed the Oct. 13th meeting of the Southern Tier Chapter ⚙.

The importance of air cooling emphasizes the somewhat new concept that martensite forms over a wide range so that martempering produces maximum martensite and maximum hardness with minimum residual stress. Cooling rate controls the transformation and therefore the structure.

Of special interest was the application of Jominy chart projections to determine the limits of maximum stock diameters which are satisfactory for martempering.

12-201. Electrical Steel. *American Machinist*, v. 91, Oct. 23, 1947, p. 139, 141.

Descriptions and types, standard mill practices, and special manufacturing practice.

12-202. Nondestructive Spot Weld Testing for Stainless Steels. *British Steelmaker*, v. 13, Oct. 1947, p. 531-532.

Use of Metroflux captive-fluid magnetic-detector cell.

12-203. Radiography Reveals Internal Quality of Die Castings. R. W. Dively. *Steel*, v. 121, Nov. 3, 1947, p. 88-89, 121.

Use of equipment manufactured by General Electric X-Ray Corp. for 100% inspection for defects such as porosity, cold shuts, inclusions, and shrinks.

12-204. Hardenability Bands for H-Steels. *American Machinist*, v. 91, Nov. 6, 1947, p. 155, 157, 159.

How to use them. Graphs for 12 of the steels.

12-205. Engineering and Manufacturing Standards. W. L. Matthew. *Product Engineering*, v. 18, Nov. 1947, p. 81-85.

Organization and maintenance of an engineering standards system. Sample standards pages and forms.

12-206. Ultrasonic Resonance Applied to Nondestructive Testing. Wesley S. Erwin and Gerald M. Rassweiler. *Review of Scientific Instruments*, v. 18, Oct. 1947, p. 750-753.

Ultrasonic vibrations of continuously varying frequency are applied to the part under test, which is set into longitudinal vibration at its natural frequencies. The consequent reaction is used to produce visible marks on a cathode-ray screen from which thickness of the part may readily be deduced.

12-207. Graphical Correlation—Its Application to Steel Mill Problems. Charles R. Taylor. *Iron Age*, v. 160, Nov. 6, 1947, p. 78-84.

The graphical-correlation method of statistical control appears to present a means whereby usual mathematical methods can be sidetracked. The solution of a specific steel-mill problem is presented to indicate the applicability of the method, as well as to suggest its potentialities.

12-208. Postwar S.A.E. Steels. *SAE Journal*, v. 55, Nov. 1947, p. 17-23.

Tables to appear in 1948 S.A.E. Handbook include 55 new compositions; 47 compositions have been deleted. Compositions and corresponding A.I.S.I. numbers are given.

12-209. Standard Steels—Wrought A.I.S.I. Types. Part II. *Machine Design*, v. 19, Nov. 1947, p. 151-163.

Tables and charts resulting from cooperative work of S.A.E. and A.I.S.I. All bands apply to steel in the as-quenched condition. Explanatory matter.

12-210. X-Ray Examination of Butt Welds. W. D. Garrick. *Engineering*, v. 164, Oct. 24, 1947, p. 404-407.

The examination of welds in pressure vessels. Although based on experience with welded drums for Yarrow boiler installations, this summary is equally applicable to all forms of fusion-welded pressure vessels. (Presented at meeting of Section G of the British Assoc., Dundee, Sept. 2, 1947.)

12-211. Crack Detection. *Nature*, v. 160, Oct. 25, 1947, p. 556-557.

Reviews papers presented at symposium on methods of crack detection held by the Industrial Radiology Group of the Institute of Physics, July 18-19, 1947.

12-212. Hardenability Bands for H-Steels. Parts IV to VI. *American Machinist*, v. 91, Nov. 20, 1947, p. 143, 145, 147.

Series of charts for 4150H to 8647H.

For additional annotations indexed in other sections, see: 27-248.

13 PYROMETRY
Temperature Control

13-50. Pyrometry and Its Application in Porcelain Enameling Plants (Concluded.) *Ceramic Forum*, v. 14, Sept. 1947, p. 2; Oct. 1947, p. 2-3, 6.

13-51. Instrumentation. Ralph H. Munch. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 95A-96A.

Design of thermowells—the protective casings around thermocouples.

13-52. Pyrometer Tips. A. J. Benedict. *Industrial Heating*, v. 14, Oct. 1947, p. 1624, 1648.

Tips for the maintenance man.

13-53. Symposium on the Contamination of Platinum Thermocouples. Section I—An Investigation of the Embrittlement of Platinum-Rhodium Wire in the Heads of Liquid-Steel Pyrometers. Section II—Fracture of Platinum and Platinum-13% Rhodium Wires Used in the Immersion Thermocouple. *Industrial Heating*, v. 14, Oct. 1947, p. 1650, 1652.

Summarizes two papers presented to Liquid Steel Temperature Sub-Committee of the British Iron and Steel Research Assoc. (To be continued.)

13-54. Thermocouple for Molten Steel. V. S. Kocho. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 498. (In Russian.)

The instrument utilizes a short quartz protecting tube attached to a graphite sleeve, which, in turn, fits over a long, bent steel tube.

13-55. Proportioning Temperature Controller. D. Lazarus and A. W. Lawson. *Review of Scientific Instruments*, v. 18, Oct. 1947, p. 730-733.

Unbalance voltage from a potentiometer is amplified by a simple circuit including a 60-cycle polarized interrupter, and used to control the extent of the on-off cycle of a furnace. The circuit responds to a change in input voltage of less than 4 microvolts. Long-term stability is limited to about 40 microvolts.

13-56. Applying Bimetal Thermostats. J. O. Moorehead. *Product Engineering*, v. 18, Nov. 1947, p. 123-127.

Basic factors in selecting and applying creep and snap-action thermostats. Eight application considerations; direct and remote-mounted thermostats; current and voltage-type compensation; effect of cup and plate-type mounting on performance.

13-57. The Theory of Unstable Processes in a Thermocouple. V. E. D'iachenko and A. F. Mal'nev. *Journal of Technical Physics (U.S.S.R.)*, v. 17, July 1947, p. 855-870. (In Russian.)

Equations are derived for the semi-stable process, thermal hysteresis, and the inertia of the thermocouple. A theory for its behavior in a field of radiant energy of periodically varying intensity is presented.

13-58. Continuous Control Thermoregulator. P. Wright. *Journal of Scientific Instruments*, v. 24, Oct. 1947, p. 258-261.

Conditions determining constancy of furnace temperature. A continuous control thermoregulator of the photocell-thyratron type in which the controlling influence is applied through a saturated choke. Records obtained with different furnaces show that variations in supply voltage are mainly responsible for furnace temperature fluctuations, and that the thermoregulator reduces these fluctuations by a factor of 1/100.

13-59. Precision of Heat Transfer Measurements With Thermocouples—Geometric Errors. W. A. Mohun and W. S. Peterson. *Canadian Chemistry and Process Industries*, v. 31, Oct. 1947, p. 908-913.

A precision method of embedding thermocouples in a tube wall to measure its surface temperature; errors involved in such measurement. Derived from a study of the cooling of the Canadian atomic energy pile.

13-60. Setting Oven Temperatures by Phasing in Thyratron Circuit. *Electronic Industries & Electronic Instrumentation*, v. 1, Nov. 1947, p. 14-15.

Circuits for setting oven temperatures.

49 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

14 FOUNDRY PRACTICE

14-311. Pouring Open-Sand Box Parts. W. Gudgeon. *Iron and Steel*, v. 20, Oct. 1947, p. 494.

Technique for avoiding overlaps.

14-312. Oliver Corp. Modernizes Its South Bend Foundries. *Link-Belt News*, v. 14, Oct. 1947, p. 1-3.

Layout, procedures and equipment.

14-313. Manufacture of Precision Castings. G. Vennerholm and E. Ensign. *SAE Quarterly Transactions*, v. 1, Oct. 1947, p. 640-649.

Various methods for manufacturing precision castings. Special emphasis is placed on the investment-molding method. Processes included are die casting, permanent-mold casting, investment molding, plaster molding, and combinations of two or more methods. (Presented at S.A.E. Annual Meeting, Detroit, Jan. 6, 1947.)

14-314. The Efficient Manufacture of Cast Iron Pipe. Gerald Eldridge Stedman. *Industrial Gas*, v. 26, Oct. 1947, p. 10-11, 31.

Procedures and equipment used by National Cast Iron Pipe Division of James B. Clow & Sons, Birmingham, Ala.

14-315. Good Housekeeping Helps Foundry Operation. Arthur Q. Smith. *Industrial Gas*, v. 26, Oct. 1947, p. 19, 25-26.

Layout and equipment of a small foundry devoted to manufacture of brass and bronze castings.

14-316. Phenolic-Resin Binders; Utilization in Sand Cores for Ferrous Castings. J. E. McMillan and E. E. McSweeney. *American Foundryman*, v. 12, Oct. 1947, p. 22-26.

Composition of phenolic resins and physical properties of the resin-bonded cores developed at Battelle Memorial Institute for use in heavy-metal founding. Results of laboratory and foundry tests which show that phenolic resins have definite advantages as core binders.

14-317. Controlling Carbon in the Cupola. W. W. Levi. *American Foundryman*, v. 12, Oct. 1947, p. 28-34.

Some of the variables which affect carbon control when melting iron in the cupola, and an equation for cal-

(Turn to page 34)

Peter F. Blackwood Dies Suddenly, Was Foundry Expert

It is our sad duty to record the unexpected death of Peter F. Blackwood, since 1935 foundry superintendent of Ford Motor Co. of Canada in Windsor, and a long-time ⚙ member. He was born in 1884 and educated in Scotland, coming to the United States in 1910. During the 25 years he was in the States he was superintendent of a blast furnace operation in Tennessee, metallurgist for Michigan Steel Casting Co. in Detroit, owner of his own foundry in Springfield, Ohio, and superintendent of the Buick Foundry in Flint.

P. F. Blackwood

He started with the Ford Motor Co. of Canada as superintendent of a foundry designed and built to cast crankshafts alone. It was not long before he was able to show a most profitable picture in the operation of this plant, and production of camshafts, flywheels, brake drums and hubs was added.

Capacity was expanded threefold during World War II; 16 electric furnaces were melting 450 tons every day, much of it going into ordnance parts previously forged. About one third of the metal was cast by the centrifugal method, an art Peter Blackwood perfected to such a degree as to warrant the Gold Medal of the American Foundrymen's Association.

In a tribute to him, an old friend, Harry Harris, writes:

"No man in modern times has set such a mark in the foundry industry or carried the organization of a foundry to the perfection of mechanism and organization as did Peter Blackwood. He had 16 large arc furnaces but employed no melters. His procedure was standardized and he used only 'furnace tenders', subject to laboratory control. He employed an assistant and two foremen whom he raised personally. He had the finest experimental setup in the country with induction furnaces, electronically controlled experimental arc furnaces, a variety of centrifugal casting machines which he built himself. His experimental setup was equipped with refrigeration, vacuum, high-pressure air and much advanced experimental rigging.

"More foundrymen crossed the river to visit Ford Canadian foundry than any foundry on earth.

"Pete had a rich Scotch brogue, a bright eye and firm handclasp. He had a kindliness and an interest in the welfare of his friends, associates and even casual acquaintances to a degree I have seen in no other man."

He was a modest man. His door was always open to anyone. Not only did his natural charm make confident the lowliest worker in the foundry, but impressed the great industrialists and renowned metallurgists that visited the Ford of Canada foundry from all parts of the allied world.

M.S.M. Hears About Toolsteels

Reported by Joseph D. Allen, Jr.

Missouri School of Mines and Metallurgy

Charles L. Clayton of Columbia Tool Steel Co. prefaced his talk on toolsteels before the second fall meeting of the Missouri School of Mines Chapter by showing a two-reel color film of plant operations at his company. The talk was further illustrated by slides depicting the effect of quenching temperatures on hardness and hardenability. Mr. Clayton stressed the importance of research in industry.

Apex Purchases National Smelting

Apex Smelting Co. of Chicago has purchased the plant, laboratories and equipment of the National Smelting Co. of Cleveland. Effective Jan. 2, 1948, the newly acquired plant will be operated as the Apex Smelting Co. Cleveland plant and will produce aluminum, magnesium, zinc-base alloys and other related products.

Welding Precautions Given For High Test Piping

Reported by Joseph A. Graber

Assistant Supervisor of Methods
Revere Copper & Brass, Inc.

Use of air hardening alloy steels and proper welding procedures for piping in the oil, power and other industries are demanded by present-day high-temperature, high-pressure requirements, asserted Roy Emerson, metallurgist of the Pittsburgh Piping and Equipment Co., before the Baltimore Chapter ⚙. The October meeting was held jointly with the Maryland Chapter of the American Welding Society, the A.W.S. acting as host.

Welding precautions include the proper selection of preheat temperature, choice of welding electrodes, method of depositing weld metal, and the proper postheating cycle.

A number of excellent slides illustrated the effect of proper and improper electrodes on the physical properties of weldments between low-alloy air hardening steels and high-alloy corrosion resisting steels. The profound effect of postheating on the physical properties of intermediate alloy steels of the air hardening type was shown.

At the end of his talk, Mr. Emerson presented slides showing the vast destruction of Germany's industrial areas.

culating the percentage of carbon to be expected in the iron at the cupola spout. (Presented at 51st Annual Meeting, American Foundrymen's Assoc., Detroit, April 28-May 1, 1947.)

14-318. Feeding Castings. S. L. Finch. *American Foundryman*, v. 12, Oct. 1947, p. 51-61.

Presented at 44th Annual Meeting of Institute of British Foundrymen, June 17-20, 1947, Nottingham, England (see item 14-237).

14-319. Sand, Gravity or Pressure? E. Carrington. *Light Metals*, v. 10, Oct. 1947, p. 526-531.

Factors affecting choice of casting methods for aluminum castings.

14-320. Making Steel Mill Rolls. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 92-93.

Manufacture at Mackintosh-Hemphill Co.

14-321. The "Lost Wax" Process. *Weld* (formerly *Victor Weld*), v. 3, Oct. 1947, p. 16-18.

Production of small precision parts by Lawrence Laboratory, Santa Monica, Calif.

14-322. Carbon Pickup in Melting Cast Iron. P. H. Shotton. *Foundry Trade Journal*, v. 83, Oct. 9, 1947, p. 115.

The factors responsible for carbon pickup in cupola melting and in electric and rotary furnace practice. In the latter a variety of carbonaceous materials are added to increase the carbon content of the product. Relative efficiencies.

14-323. The Chipping Operation. R. E. Chapman. *Foundry*, v. 75, Nov. 1947, p. 72-75, 228, 230, 232, 234, 236, 238.

The chipping foreman; the chipper; tools used by the chipper; the chipping operation as conducted in the foundry. (Presented at 2nd Annual Technical and Operating Conference of Steel Founders' Society of America, Cleveland, June 6, 1947.)

14-324. New Gray Iron Foundry Combines Efficiency and Cleanliness. William G. Gude. *Foundry*, v. 75, Nov. 1947, p. 76-81.

Layout and equipment of Wells Mfg. Co.'s new foundry in Skokie, Ill.

14-325. Visual Analysis of Sand Grain Distribution. C. A. Sanders. *Foundry*, v. 75, Nov. 1947, p. 82-84, 216.

Five visual screen analyses using the test-tube method; respective advantages or disadvantages. A sand with wide grain distribution (from 30 to 200 mesh) is recommended for easy bonding and best over-all properties.

14-326. Permanent Mold Casting of Aluminum. Edwin Bremer. *Foundry*, v. 75, Nov. 1947, p. 86-89, 223-224, 226, 228.

Procedures and equipment used in production of about 1,500,000 lb. of castings per month at Cincinnati foundry of Aluminum Industries, Inc.

14-327. Belgian Foundries. Vincent Delport. *Foundry*, v. 75, Nov. 1947, p. 92-93, 218, 220, 222.

Present Belgian foundry practice, based on information obtained during recent visit.

14-328. Reliability of Test Bar Properties as a Measure of the Quality of 85-5-5-5 Alloy Melts. L. W. Eastwood and J. G. Kura. *Foundry*, v. 75, Nov. 1947, p. 94-99, 168.

Recommendations on test bar practice for 85-5-5-5 alloy are given in this seventn and concluding article based on investigations sponsored by the Non-Ferrous Ingot Metal Institute.

14-329. Use of Exothermic Cores in Pouring Stainless Steel. Maurice Beam. *Foundry*, v. 75, Nov. 1947, p. 140, 142.

Use to promote adequate feeding of the castings by maintaining the riser metal fluid until the casting has solidified. In addition to exothermic cores or ring inserts placed under feeding heads, an exothermic powder compound is also placed on top of the risers immediately after filling the mold.

14-330. A Realistic Appraisal of the Precision Investment Casting Process. W. O. Sweeny. *Iron Age*, v. 160, Nov. 6, 1947, p. 86-90.

Overly enthusiastic claims have served to confuse designers and embarrass castings producers. A sound, realistic understanding of the advantages and limitations of the process is desired. Considerations are tolerances, holes, walls, edges, threads, surfaces, size, weight, and inspection.

14-331. Centrifugal Casting. *Metal Industry*, v. 71, Oct. 24, 1947, p. 349.

Methods employed by German technicians. (Condensed from a recent F.I.A.T. report.)

14-332. Coulée en Coquille de Pièces en Alliages de Magnésium. (Chill Casting of Magnesium Alloy Objects.) Jean Duport. *Fonderie*, Aug. 1947, p. 770-772.

Alloy compositions, melting techniques, and equipment required.

14-333. The Economics of Mechanical Shakeout. James L. Yates. *Iron Age*, v. 160, Nov. 13, 1947, p. 88-93.

Specific operating data covering a variety of sizes and types of flasks.

14-334. Temperovani litiny s Cernym Lomem. (Annealing of Black Heart Malleable Cast Iron.) Milos Knotek. *Hutnické Listy*, v. 2, Aug. 1947, p. 31-36.

How to achieve considerable economy and improvement in quality in the production of malleable castings, without use of pig iron, by properly planned annealing. Deoxidation with aluminum and effects of copper additions.

14-335. Entwicklung und Gegenwärtiger Stand des Stranggiessens von Nichteisenmetallen. (Development and the Present State of the Continuous Casting of Nonferrous Metals.) Hermann Kästner. *Stahl und Eisen*, v. 66-67, Jan. 2, 1947, p. 10-19.

Development and present status of the industry in Germany. Diagrams showing equipment and procedures.

14-336. Zhotovovani Trvalych Forem k Odlevani Odlitku ze Sede Litiny. (Preparation of Semipermanent Molds for Gray-Iron Castings.) Josef Vorlicek. *Hutnické Listy*, v. 2, Sept. 1947, p. 61-65.

The factors involved in preparation of the above and a detailed description of the preparation of molds and the casting procedure by which 50 to 100 (some say up to 170) pieces are produced with one mold. Composition of the mold material and the mold coating. Cost savings are said to be 50 to 65%.

14-337. Observations on the Control of Grain Size in Magnesium Casting Alloys. Vernon C. F. Holm and Alexander I. Krynitsky. *Journal of Research of the National Bureau of Standards*, v. 39, Sept. 1947, p. 265-270.

See item 14-296.

14-338. A Problem of Venting. *Foundry Trade Journal*, v. 83, Oct. 23, 1947, p. 156.

Various solutions to the problem of venting of hollow cast-iron rollers having cored holes at either end.

14-339. Casting Artistic Bronzes. Pat Dwyer. *Foundry*, v. 75, Nov. 1947, p. 66-71.

Procedures and products. (To be concluded.)

For additional annotations indexed in other sections, see: 3-366; 4-177; 6-283; 15-44; 16-144.

15 SALVAGE AND SECONDARY METALS

15-41. Nonferrous Metals; Influence in Scrap for Steelmaking. Edmund R. Thews. *Iron and Steel*, v. 20, Oct. 1947, p. 479-480.

Costs of scrap sorting and effects of specific metallic and nonmetallic impurities.

15-42. Waste Pickle Conversion to New Material. William Bull. *Chemical Age*, v. 57, Oct. 4, 1947, p. 465-466.

Applicability to British practice of a sulphuric (or hydrochloric) acid pickle-liquor disposal method developed recently in the U. S. A cellular, insulating, building-construction material known as "Ferron" is produced. The method is in commercial operation in the plant of the Sharon Steel Corp., Sharon, Pa.

15-43. Zinc Oxide From Brass Scrap. A. G. Arend. *Paint Technology*, v. 12, Sept. 1947, p. 329.

A process operated in the Glasgow district several years ago, in which the oxide was accumulated as a light fluff instead of passing off as fume.

15-44. Utilisation des Tournures de Fonte dans un Four Rotatif. / (Use of Cast Iron Turnings in a Rotating Furnace.) Henry Gernelle. *Fonderie*, Aug. 1947, p. 772-775.

The "foliated" appearance of cast iron in which turnings have been used. Various remedies and precautions to be taken.

15-45. New Data Concerning Straightening of Welded Aircraft Structures. A. Ia. Brodskii. *Avtogennoe Delo (Welding)*, Aug. 1947, p. 14-19. (In Russian.)

Precautions necessary in straightening welded structures by localized heating. A formula for determining the buckling point of cold straightened, tubular specimens. Effects of various factors.

15-46. Cold Repair of Broken Castings. *Engineer*, v. 184, Oct. 24, 1947, p. 395.

System described consists of driving a number of specially shaped key elements into the metal transversely across the crack or rupture and then sealing them in position by cold working. These elements are made of a series of high-nickel alloys, including metals having a selective range of thermal-expansion coefficients. The type of element is selected according to the requirements of the part to be repaired.

For additional annotations indexed in other sections, see: 7-405; 10-210; 18-245; 22-628.

16 FURNACES AND FUELS

16-134. Blast Furnace Relined and in Service in 44 Days. *Blast Furnace and Steel Plant*, v. 35, Oct. 1947, p. 1227-1229.

General information and data relative to this accomplishment.

16-135. Metal Recuperators. H. Escher. *Iron and Steel*, v. 20, Oct. 1947, p. 501-504.

Details of a new design for high-temperature furnaces. The recuperative, continuous-firing method is used with either pulverized coal or gas or mixtures as fuel. About 60 large units have been erected or are under construction and are used for preheat-

(Turn to page 36)

Experimental Openhearth Operations Described

Reported by R. J. Halstead

Metallurgist, Metals Refining Co.

An experimental openhearth furnace operated at Jones & Laughlin Steel Corp. was described by Harold K. Work, director of research for Jones & Laughlin, before the Calumet Chapter on Oct. 14. The occasion was National Officers' Night, with Dr. Work, who is ⊜ national vice-president, delivering the main address of the evening on "Research in Steelmaking".

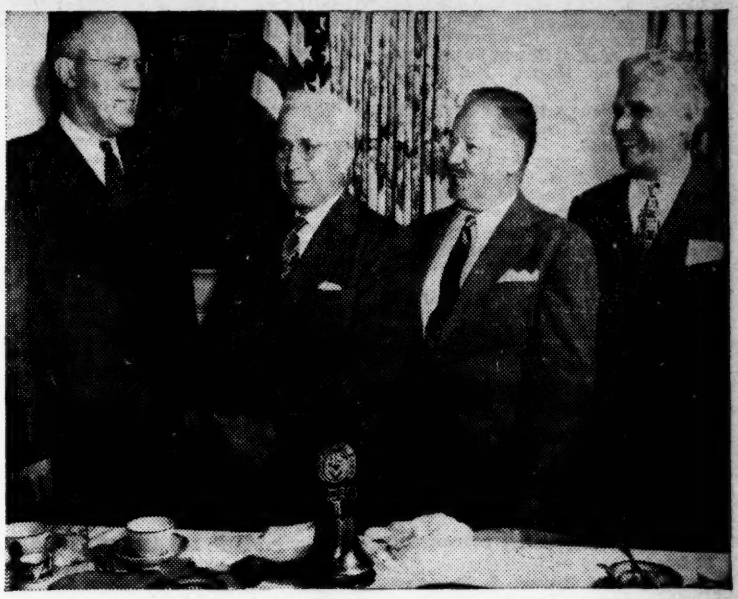
National Secretary W. H. Eisenman gave the coffee talk, which was of a varied nature including some of his famous stories, an account of national society activities, and thanks to the chapter for its continued cooperation.

Dr. Work told how such items as refractories, alloying elements and deoxidizing practices could be studied in an experimental unit without affecting plant operations. Steels produced in this furnace, he said, exhibited comparable tensile strengths, elongations, and somewhat better cold working properties than steels produced in the plant.

Proceeding to the bessemer process, Dr. Work pointed out that it is difficult to control quality of steel from heat to heat because of variation in operation. Successful use has been made of photocells to control duration of blow. Control of afterblow is vital to the quality of the steel.

Tests were made of the effects of nitrogen on cold working properties of steel. Izod test pieces were cold worked to varying degrees, aged at 450° F. for 1 hr. and fractured. Both nitrogen and deoxidizing practice affect strain sensitivity of steel.

A movie depicting the operation of the experimental openhearth was shown at the conclusion of the talk. A. J. Scheid, chief metallurgist of Columbia Tool Steel Co., acted as technical chairman and led a lively discussion.



Harold K. Work (Left), ⊜ National Vice-President, Gave the Principal Address at National Officers' Night at the Calumet Chapter. Next to him is R. B. Lucas, chapter chairman, followed by National Secretary Eisenman and A. J. Scheid, technical chairman

Abrasive Use Encompasses Wide Range of Industries

Abrasives play some part in almost all manufactured products. On this premise Francis Bowman of the Carborundum Co. elaborated in his address to the Ottawa Valley Chapter ⊜ on Nov. 4.

A film "The Romance of Abrasives" was shown, in which the historical events were re-enacted. Beginning with Dr. Acheson's discovery of silicon carbide crystals, it carried on through to the present day when abrasives are made on a large tonnage basis.

A major portion of the picture is devoted to industries showing the application of abrasives in grinding, cutting and polishing. Applications range from the grinding of large manganese iron castings to cutting the narrow slot in pen points or grinding intricate designs on glass.

ing air and various fuel gases. They have been applied to billet heating, forge furnaces, soaking pits, and glass-melting furnaces. Proposed design and calculations for 125-ton steel melting furnace. (Condensed from paper presented at World Power Conference, The Hague, Netherlands, Sept. 3, 1947.)

16-136. Induction Melting of High-Alloy Steels. *Industrial Heating*, v. 14, Oct. 1947, p. 1644, 1646.

Summary of paper by R. J. Wilcox of Michigan Steel Castings Co., at recent Electric Furnace Steel Conference, Pittsburgh, Pa.

16-137. The Design of Industrial Ovens With Special Reference to Safety. C. A. Litzler. *Industrial Heating*, v. 14, Oct. 1947, p. 1710-1712, 1714-1715.

Condensed from paper presented at recent conference of the Industrial and Commercial Gas Section of the American Gas Assoc., Boston, Mass. (To be continued.)

16-138. Controlled Furnace Atmospheres. *Aircraft Production*, v. 9, Oct. 1947, p. 380-381.

Use of paraffin burners in new British equipment.

16-139. Some Features of Openhearth Furnace Design—II. G. Reginald Bashforth. *British Steelmaker*, v. 13, Oct. 1947, p. 502-511.

Furnace roofs; ports; regenerators. 16 ref.

16-140. Infrared Drying. L. Sanderson. *Machinery Lloyd (Overseas Edition)*, v. 19, Oct. 11, 1947, p. 75-77.

Method applications, equipment, advantages.

16-141. Multiple-Position Coils Speed Induction Heating. Frank W. Curtis. *American Machinist*, v. 91, Oct. 23, 1947, p. 90-93.

Some typical coil arrangements.

16-142. How a Steel Mill Prepares Blast Furnace Gas for Fuel—I. W. M. Cline, Jr. *Power*, v. 91, Nov. 1947, p. 72-73.

Blast furnace operating principles; control of gas output; amounts of gas involved; gas storage; gas distribution. (To be continued.)

16-143. Furnace With Tungsten Heating Elements. O. P. Mchedlov-Petrosian. *Factory Laboratory (U.S.S.R.)*, v. 13, April 1947, p. 494-495. (In Russian.)

A laboratory tube furnace for temperatures of 1500° C. inside the tube.

16-144. Advantages of Induction Furnaces in Line Die Casting. Herbert Chase. *Steel*, v. 121, Nov. 10, 1947, p. 108-109, 136, 138.

Iron pickup and drossing losses are reduced and variations in composition minimized. Use of "hardener" rod provides a convenient means of preparing alloy without pigging. Feeding molten alloy through heated troughs to many holding furnaces is reported to be highly successful.

16-145. Evaluation of Openhearth Checkers. Walter B. Bryant. *Iron Age*, v. 160, Nov. 13, 1947, p. 76-81.

Various arrangements and sizes of openhearth checkers, from the viewpoints of cleanliness, stability, expansion and contraction, and effectiveness. The more common arrangements, and a special-type tile. Performance data covering 11 installations.

16-146. Automatic Rapid Raising of Electrodes. S. A. Kremera and B. M. Khorkova. *Industrial Power (U.S.S.R.)*, v. 4, Sept. 1947, p. 12-13. (In Russian.)

Electrical circuit for speeding up the manipulation of electrodes during the operation of electric furnaces.

16-147. Factors Affecting Heating by Induced Electric Current. Harlan A. Messner. *Production Engineering & Management*, v. 20, Nov. 1947, p. 60-63.

The phenomenon of electrically induced heat and the factors affecting its use as a production-line tool.

16-148. Karburierung und Beheizung von Siemens-Martin-Ofen mit Steinkohlenstaub. (Carburizing and Heating With Pulverized Coal in Siemens-Martin Furnaces.) Kurt Guthmann. *Stahl und Eisen*, v. 66-67, March 27, 1947, p. 116-122.

Application of pulverized coal for carburizing and heating in a Siemens-Martin furnace. American experience with this type of fuel.

16-149. The All-Basic Openhearth Furnace; Proposed System of Construction. J. E. Pluck. *Engineers' Digest (American Edition)*, v. 4, Oct. 1947, p. 456-460.

Advantages and disadvantages of the all-basic furnace; use of basic uptakes in Britain; expansion properties of refractories; continental roof construction; the original weight-balanced roof; proposed roof construction for fixed and tilting furnaces and their load and force diagrams; furnace insulation. Proposed construction will allow more even distribution of loads. (Condensed from *Iron and Coal Trades Review*, v. 155, Aug. 8, 1947, p. 257-265.)

16-150. Radio-Frequency Heating—What It Is and How It Works. B. E. Rector. *Machinery Lloyd (Overseas Edition)*, v. 19, Oct. 25, 1947, p. 100-103.

A nontechnical explanation of the basic principles of induction and dielectric heating.

For additional annotations indexed in other sections, see: 2-258.

17 REFRACTORIES
Furnace Materials

17-87. Refractories. Raymond E. Birch. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 1238-1242.

Recent developments in refractory materials and their use. 42 ref.

17-88. Carbon and Graphite. C. E. Ford. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 1202-1204.

Recent developments in use of the above both in chemical and in metallurgical industry. 34 ref.

17-89. Permeability Data on American Refractories. D. O. McCreight. *Industrial Heating*, v. 14, Oct. 1947, p. 1734, 1736, 1738, 1740.

Permeability determinations were made on refractory brick by measuring the flow of air through the brick under a definite applied pressure. Apparatus and procedure for fireclay, high-alumina, silica, basic, and insulating brick. (Condensed from paper presented at 49th Annual Meeting, American Ceramic Society, Atlantic City, N. J., April 1947.)

17-90. Cheap Oxygen—Will It Change Clay Products and Refractories Industry? *Brick & Clay Record*, v. 3, Oct. 1947, p. 62.

Synthetic gas from cheap coals, changes in processing of clay ware, and new requirements for refractories are among the indicated trends.

17-91. How U. S. Fireclay Deposits Occurred and Their Properties Developed. Part II. J. O. Everhart. *Brick & Clay Record*, v. 3, Oct. 1947, p. 60-61.

Typical chemical analyses of representative fireclays and the firing behaviors of several fireclay samples.

17-92. To Test Basic Refractories and Oxygen in Openhearth at Higher Heat. *Brick & Clay Record*, v. 3, Oct. 1947, p. 55-57, 59.

Details of the construction of an experimental 122-ton openhearth furnace by Carnegie-Illinois at South Chicago to determine the advantages of basic linings when oxygen is used. In addition it will provide an opportunity for comparing the characteristics of various kinds of refractories. Experiments will include the use of oxygen in different kinds of burners, and the use of preheated compressed air for atomization of oil. Studies will be made of flame radiation, effects on furnace efficiency of the higher temperatures permissible with basic linings, and of possible new steelmaking procedures.

17-93. Studies Steelmaking Procedures in All-Basic Openhearth. *Steel*, v. 121, Nov. 3, 1947, p. 112, 115-116, 118.

See item 17-92.

17-94. All-Basic Openhearth Furnace to Be Used for Experimental Purposes. *Blast Furnace and Steel Plant*, v. 35, Oct. 1947, p. 1209-1212.

See item 17-92.

17-95. All-Basic Openhearth Furnace Built by Carnegie-Illinois. *Industrial Heating*, v. 14, Oct. 1947, p. 1721-1722, 1724, 1726, 1728, 1730, 1732.

See item 17-92.

17-96. Design of All-Basic Openhearth. *Iron and Steel Engineer*, v. 24, Oct. 1947, p. 78-83.

See item 17-92.

17-97. Properties of Refractory Materials. *Industrial Diamond Review*, v. 7, Oct. 1947, p. 299.

A tabulation covering 17 materials. 18 ref.

17-98. Need of Newer Refractories for Higher Temperatures Stressed at A.C.S. Meeting. *Brick & Clay Record*, v. 3, Nov. 1947, p. 62, 64, 66.

Summaries of following papers presented at American Ceramic Society, Refractories Division Symposium, Bedford, Pa., Oct. 10, 1947: Introduction to the study of the refractory oxides, by Ray E. Birch. Simple oxide porcelains for jet planes and projectiles, by R. F. Geller. Properties and uses of mullite and pure alumina refractories, by G. Bickley Remmey. Zircon and zirconia refractories, by C. E. Curtis and E. Thomas. Carbon as a refractory material, by F. B. Thatcher.

18 HEAT TREATMENT

18-223. Electric Salt Baths for Wire Processing. H. J. Babcock. *Wire and Wire Products*, v. 22, Oct. 1947, p. 751-753, 756-760.

Developments of past ten years.

18-224. Continuous Gas Carburizing of Steel Without a Gas Generator. Walter H. Holcroft and Edward C. Bayer. *Materials & Methods*, v. 26, Oct. 1947, p. 92-93.

A mixture of industrial gas and rich hydrocarbon gas makes possible continuous gas carburizing without additional equipment.

18-225. Some Trends and Fallacies in French and Belgian Metallurgical Practices. Davidlee Von Ludwig. *Industrial Gas*, v. 26, Oct. 1947, p. 7-9, 27-30.

Discussion resulting from visits to 51 industrial plants limited to controlled-atmosphere practices. Trends are toward their more widespread use and away from German and British techniques toward American ones. "Fallacies" are a frequent lack of appreciation of fundamental gas laws, as illustrated by introduction of controlled atmospheres into chambers with both ends wide open.

(Turn to page 38)

Southern Conference Is Sponsored by 3 A.S.M. Chapters

Reported by Michael F. Wiedl

Michael F. Wiedl and Associates

The first ABC Southern Conference of A.S.M. chapters located in Atlanta, Birmingham and Chattanooga was held at the Bankhead Hotel, Birmingham, Ala., on Nov. 4. More than 125 members of the three chapters attended this conference.

In outlining the thought underlying this first conference of Southern A.S.M. Chapters, R. S. Lynch, president of the Atlantic Steel Co., and immediate past chairman of the Georgia Chapter, said: "The purpose of the ABC Conference is to encourage and to give impetus to the development of the machinery, manufacturing and metalworking industries in the Southern States; to acquaint the trade with their progress and development; to assemble and to disseminate to these industries current information upon production, research, technical developments and inventions.

"The industrial future of the Southeast is bright," Mr. Lynch concluded. "That it will grow and develop is assured . . . The industrial revolution in the Southeast is well under way, making possible a higher living standard for its people, increased industrial development of its many natural resources, and a better education for all."

Georgia Chapter members who attended the conference included Chairman Alva S. Wilson, Vice-Chairman Russell E. Bobbitt, Jr., Secretary Michael F. Wiedl, and Treasurer deWitt H. Gunsolus, along with ten members of the executive committee and many other members at large.

All those attending the conference visited the Southern Research Institute. Other tours of Birmingham industrial plants included Tennessee Coal, Iron & Railroad Co.; American Cast Iron Pipe Co.; and Chicago Bridge & Iron Co.

"New Developments in Technique of Welding and Cutting" was the subject of an address by John H. Zimmerman, development manager, Linde Air Products Co., New York City.

Stainless Fabrication Discussed

Reported by Floyd B. Allen

Tool Engineer, Remington Rand, Inc.

Eric Von Hambach, research and development engineer, Carpenter Steel Co., opened the fall season of the Southern Tier Chapter with a paper on "Applications and Fabrication of Stainless Steels".

Mr. Von Hambach dispelled many misconceptions regarding the machinability of stainless steels. His applications of tooling practices, supervision and psychological treatment of operators were broad enough to include all types of metalworking problems.

Rome Chapter Receives Charter

Rome Chapter Received Its National Charter From William H. Eisenman, National Secretary (Extreme Right), on Nov. 6. Looking on (left to right) are Francis B. Foley, national president; Louis H. Decker, chapter secretary-treasurer; R. Carson Dalzell, chairman; and Lloyd R. Dickinson, program chairman. President Foley gave the main technical address of the evening, and School Superintendent Lyndon H. Strough spoke on the interests of the schools in the society, noting that education is the fundamental purpose of both bodies

18-226. Continuous Carburizing and Hardening of Piston Pins at the Ford Rouge Plant. *Industrial Heating*, v. 14, Oct. 1947, p. 1580-1582, 1584, 1586, 1588, 1590, 1592, 1755-1756, 1758, 1760.

18-227. Scale (Iron Oxide). W. Trinks. *Industrial Heating*, v. 14, Oct. 1947, p. 1601-1602, 1604.

Fundamental principles of scale formation on heating of iron or steel.

18-228. Flame Hardening Locomotive Brake and Spring Rigging Pins and Bushings. B. W. Covell. *Welding Journal*, v. 26, Oct. 1947, p. 918-922.

Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.

18-229. Practical Heat Treatment. Henry Pfahl and G. D. Rahrer. *Steel Processing*, v. 33, Oct. 1947, p. 630-634.

Fundamentals of normalizing; annealing; quenching and tempering; austempering; martempering.

18-230. Soluble Oil in Flame Hardening Operations. Stephen Smith. *Iron and Steel Engineer*, v. 24, Oct. 1947, p. 59-63; discussion, p. 63.

Use of soluble oil solutions as a quench because of their ability to quench steel rapidly through the critical zone, as well as at a slower rate in the lower temperature range. (Presented at A.I.S.E. Annual Convention, Cleveland, Oct. 4, 1946.)

18-231. Salt Baths—for High Speed Steel Hardening. W. E. Bancroft. *Canadian Metals & Metallurgical Industries*, v. 10, Oct. 1947, p. 22-25, 31-32, 34.

Types; applications and limitations; time-temperature cycles; operation and maintenance; costs.

18-232. Steel Treating Without Decarburization in Controlled Atmospheres. Harry E. Lewis. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 94-99, 111.

Elementary principles; various types of atmosphere-producing equipment, from the user's point of view.

18-233. Interrupted Quenching as a Metallurgical Tool. C. H. Lekberg. *Steel*, v. 121, Oct. 27, 1947, p. 79, 107-108, 111.

Techniques and equipment used in austempering, isothermal quenching, and martempering. (From Information Letter No. 10, Industrial and Commercial Gas Section, American Gas Association, New York.)

18-234. Skin Hardening. R. J. Brown. *Automobile Engineer*, v. 37, Oct. 1947, p. 389-390.

Some aspects of the high-frequency induction process.

18-235. Bright Annealing Replaces Pickling in Porcelain Enameling Plant. A. R. Mallonn. *Iron Age*, v. 160, Nov. 6, 1947, p. 91.

Condensation of paper presented at 9th Annual Porcelain Enamel Institute Forum, Columbus, Ohio.

18-236. X-Ray Investigation of Carbide Formation During the Tempering of Carbon Steel. I. V. Isaichev. *Journal of Technical Physics (U.S.S.R.)*, v. 17, July 1947, p. 839-854. (In Russian.)

Carbide formation during tempering of hardened 1.04% C steel was studied using X-ray methods.

18-237. Flame-Hardening Machine Tool Parts. W. D. Whalen. *Production Engineering & Management*, v. 20, Nov. 1947, p. 75-77.

Processing of numerous parts in small quantities; volume production of a single product.

18-238. Automatic Flame Hardening. M. R. Nelson. *Machinery*, v. 54, Nov. 1947, p. 150-153.

Typical automatic flame hardening operations on gears, wheels, long and short rolls and cylinders, and flat surfaces.

18-239. Influence du Recuit de Détente sur la Structure de la Perlite et les Propriétés Mécaniques des Aciers Moulés. (Influence of the Stress-Relief Anneal on the Structure of Pearlite and the Mechanical Properties of Cast Steels.) Francis Meunier. *Revue de Métallurgie*, v. 44, Jan-Feb. 1947, p. 39-46.

Results of investigations on the mechanical properties of cast steels, corroborating the data obtained by Jolivet on the mechanism of formation of globular pearlite by annealing above the point of transformation to pearlite. American work is cited.

18-240. Some Developments in the Annealing of Malleable White Iron. Ivor Jenkins. *Metal Treatment*, v. 14, Autumn 1947, p. 175-193.

The fundamentals of the production of white malleable iron. Several processes are involved, including decarburization, diffusion, and the solution of precipitates in austenite. The development of the modern gaseous-annealing process and plant. Suggestions for research. 16 ref.

18-241. Deep Nitriding of Cutting Tools. B. I. Kostetsky and G. D. Kuruklis. *Engineers' Digest (American Edition)*, v. 4, Oct. 1947, p. 489-490.

Results of a series of experiments including surface preparation and use of catalysts. Procedure adopted; results of service tests in comparison with the old process show fourfold improvement. (Translated and condensed from *Stanki i Instrument*, no. 6, 1946, p. 16-19.)

18-242. Salt Bath Annealing Proves Fast and Versatile. E. L. McReynolds. *Wire and Wire Products*, v. 22, Nov. 1947, p. 883-884, 916.

Advantages of salt bath annealing.

18-243. An Investigation of Tempered Chromium-Silicon Spring Steel. *Wire and Wire Products*, v. 22, Nov. 1947, p. 895, 918-920.

Mechanical properties of above wire (0.57% C, 0.76% Mn, 0.014% P, 0.017% S, 1.60% Si, and 0.77% Cr), as dependent on hardness level (48.5, 50, or 52.5 Rockwell C) and heat treatment procedure. (Presented at meeting of A.S.M., Chicago, Oct. 20-25, 1947.)

18-244. The Process of Suspended Carburization. *Industrial Gas*, v. 26, Nov. 1947, p. 13-15, 24-26.

Recently developed process whereby a charge of steel undergoing carburization can be placed in a state of suspension for an indefinite period without harmful effect, and at the conclusion of this period, the carburization can be resumed at the point where it was halted.

18-245. Salvage of Cast Iron Through Heat Treatment. Davidlee V. Ludwig. *Materials & Methods*, v. 26, Nov. 1947, p. 87-89.

How Sperry Gyroscope Co. applied growth tendency of cast irons to the corrective heat treatment of 700 ballistic cams worth $700 each which had been found to have defective internal structures. A special jig was used to prevent distortion, and the growth was adequate to permit regrinding of all controlled dimensions. The process has since been used on miscellaneous parts, but is especially applicable to cast iron engine cams and crankshafts.

19 WORKING—Rolling, Drawing, Forging

19-352. Form Tools. William F. Walker. *Edgar Allen News*, v. 26, Aug. 1947, p. 886-888.

Continues description of circular form tools. (To be continued.)

19-353. Shot-Peening Increases Life of Machinery Parts. R. B. Huyett. *Steel Processing*, v. 33, Sept. 1947, p. 553-557, 573.

The process and its quantitative life-increase effects on a series of automotive and aircraft parts. Use of the Almen gage to compare the intensities of peening operations; how cracked shot are removed in the air-wash separator. (To be continued.)

19-354. Shot-Peening Increases Life of Machinery Parts. Part II. (Concluded.) R. B. Huyett. *Steel Processing*, v. 33, Oct. 1947, p. 609-613, 638, 647.

Storage bins for automatic continuous replenishing of shot; design of centrifugal wheels for shot projection; machines for peening a variety of parts; use of the air blast; shot standards and quality; testing of shot.

19-355. Carbide Sheet Metal Dies. Earle Glen. *Steel Processing*, v. 33, Oct. 1947, p. 618-621.

Use of sintered carbides in progressive dies, draw dies, blanking dies, and punches. Design principles.

19-356. Extruding Aluminum Alloys. R. W. Graham. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 70-73, 100-101.

Production of standard extruded sections such as pipe, tubing, forging stock, channels.

19-357. Die-Grams. Karl L. Bues. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 108-109.

A compound forming die used in a secondary operation to form a part with two pairs of ears at right angles and in opposite directions to each other.

19-358. Magnesium Alloy Forgings. John Alico. *Light Metal Age*, v. 5, Oct. 1947, p. 14-17.

Properties; processes; cleaning and finishing procedures; present and potential applications. 11 ref.

19-359. Homestead's 160-In. Plate Mill. W. H. Gilleland and W. D. Hacker. *Iron and Steel Engineer*, v. 24, Oct. 1947, p. 35-43.

Refinements in plate mill design are reflected in better quality and accuracy in finished plate, as well as in increased production. (Presented before A.I.S.E. Pittsburgh District Section Meeting, Jan. 13, 1947.)

19-360. Modern Electrical Control for Wire Mill Machinery. O. M. Bundy. *Iron and Steel Engineer*, v. 24, Oct. 1947, p. 64-71.

Presented at A.I.S.E. Birmingham District Section Meeting, April 5, 1947.

19-361. Instrument Wire Manufacture. *Wire Industry*, v. 14, Oct. 1947, p. 560.

Information on several German plants. The products are said to be of mediocre quality.

19-362. The Rolling of Metals: Theory and Experiment—Part XV. Discussion of Certain Practical Rolling Problems in the Light of the Theory of Rolling. L. R. Underwood. *Sheet Metal Industries*, v. 24, Oct. 1947, p. 1984-1989.

The problems are considered under the following headings: rolling speed; roll diameter; strip tension; strip lubrication; and roll shape or camber. (To be continued.)

19-363. Hi-Carbon Wire Drawing. James H. Janssen. *Wire and Wire Products*, v. 22, Oct. 1947, p. 764-766.

(Turn to page 40)

Need for Stress Analysis Research Seen, Rules for Metallurgist Given

Reported by R. F. Thomson

Metallurgist, International Nickel Co., Inc.

William P. Woodside, ⊖ founder member and past national president, was honored by the Detroit Chapter for the fifth time, when the Annual Woodside Memorial Lecture was presented on Oct. 13. The lecture was delivered by M. A. Grossmann, director of research, Carnegie-Illinois Steel Corp., on "Steels for Adverse Conditions of Stress".

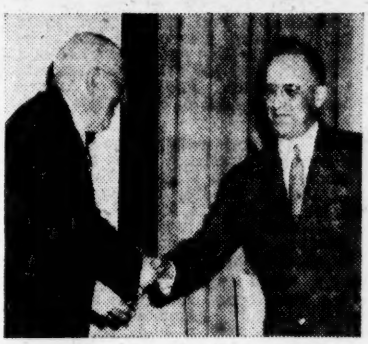
Dr. Grossmann's lecture was divided into two parts: The first dealt with the various states of stress, and the second with data the metallurgist can apply in selecting a material for a given application.

Under triaxial tension stress conditions, he said, the stress required for a given strain is markedly greater than the stress required under biaxial conditions for the same amount of strain. The latter stress, in turn, is only slightly greater than that required in simple tension.

Although a considerable amount of work has been done on flow behavior and these experimental data can be correlated reasonably well with theoretically derived data for isotropic materials, "our lack of knowledge of true fracture strength keeps the picture qualitative", Dr. Grossmann concluded.

In simple compression testing, the type of deformation seems to be a function of the friction between test specimen and testing head. When friction is high, considerable bulging of specimen sides is observed; when friction is low, no bulging occurs.

Under conditions of triaxial compression testing, Dr. Grossmann showed a slide of a "brittle" material, marble, which underwent appreciable permanent deformation without fracture,



W. P. Woodside (Left) and M. A. Grossmann Exchange Congratulations After Dr. Grossmann Delivered the Annual Woodside Memorial Lecture Before the Detroit Chapter

whereas simple compression caused shear failure with no plastic flow. This same behavior has been noted in "brittle" cast metals such as cast iron and bronze.

In discussing the effect of temperature, the speaker pointed out that strength increases and ductility decreases as temperature is lowered. Increasing the speed of straining has an effect similar to lowering the temperature.

Knowing these data, the question of the true state of stress in a given application becomes of paramount importance. The stress analyst must supply the answer to these questions. While waiting for these answers from stress analysis research, the metallurgist can be guided by the following tests and rules in selecting a material for adverse stress conditions:

The transition temperature in the notch impact test does show a trend and those steels with lower transition temperatures are likely to perform better. In general, for the same hardness, a tempered martensite is preferable to upper bainite which, in turn, is superior to pearlite. A fine-grained steel shows a lower transition temperature than a similar coarse-grained steel. Lower carbon and aluminum deoxidation also lower transition temperatures. Mixed structures of martensite and small amounts of ferrite produced by "slack quenching" show very poor notch impact values at given hardness levels.

Broaching Tools Inspected

Reported by John R. Dobie

Heat Treat Foreman
American Steel & Wire Co.

George A. Roberts, chief metallurgist, Vanadium-Alloys Steel Co., addressed the Worcester Chapter ⊖ at its October meeting. Details of his address on toolsteels were published in the November issue of *Metals Review*, page 29.

William Gibbons, assistant superintendent of the LaPointe Machine Tool Co., Hudson, Mass., also presented a technicolor film which showed broaching machinery in operation. This supplemented an afternoon visit to the LaPointe plant in charge of Mr. Gibbons and Orum R. Kerst, executive committee member of Worcester Chapter.

Experimental results obtained indicate that cooled blocks along with heavier drafting definitely improve the physical properties of high-carbon wire, especially the larger sizes. (Presented at Wire Assoc. Convention, Chicago, Oct. 1947.)

19-364. The Fabrication of Tungsten Wire. Sidney Schein and Jack W. Forbes. *Wire and Wire Products*, v. 22, Oct. 1947, p. 767, 770-771, 836-838.

A description of processes. (Presented at Wire Assoc. Convention, Chicago, Oct. 1947.)

19-365. Improvements in the Wire Industry in the Last Ten Years. *Wire and Wire Products*, v. 22, Oct. 1947, p. 802-805, 808-812, 819-824.

Symposium: Brass-copper and bronze wire. Alloy and heat-resisting wires. Low and high carbon steel wire. Advances in the wire drawing field during the past ten years, by Earl Glen. Improvements in nonferrous practice, by Matthew J. Donachie. Advances in pickling, by Walter G. See. (Presented at Wire Assoc. Convention, Chicago, Oct. 1947.)

19-366. Nitrided Steel Hot Formed After Heat Treatment. Jack Frazier. *Materials & Methods*, v. 26, Oct. 1947, p. 80-83.

Experimental development of a satisfactory procedure for economically producing formed parts with high hardness values. The results obtained contradict several of the accepted ideas about processing a nitriding steel, and no theory has been developed to explain why these results were obtained. Sleeve valves for an internal-combustion engine were made of Nitralloy 125 by use of a combined forming and pressure-quenching operation. The sleeves showed less than 0.0005 in. wear after 1000 hr. of operation.

19-367. Forging Stainless Steel. *Materials & Methods*, v. 26, Oct. 1947, p. 125.

Forging range and compositions for 13 austenitic, 12 martensitic, and 3 ferritic stainless steels.

19-368. Bending Spar Booms. *Aircraft Production*, v. 9, Oct. 1947, p. 369.

Technique for handling tough alloy of heavy section.

19-369. Drawing Die Problems and Formulas. Part 6. The Techniques of Drawing. James Walker. *Tool Engineer*, v. 19, Oct. 1947, p. 29-35.

Triple and double-action presses; how to eliminate or minimize burrs, wrinkling, and buckling; design of pressure rings and pins, and bolster plates; mounting of punches and dies and calculation of press tonnages. (To be continued.)

19-370. The Effect of Speed of Rolling in the Cold-Rolling Process. H. Ford. *Blast Furnace and Steel Plant*, v. 35, Oct. 1947, p. 1219-1223.

Condensed from *Journal of the Iron and Steel Institute*. 17 ref. (To be continued.)

19-371. Form Tools. Part VI. Dovetail Form Tools. (Continued.) William F. Walker. *Edgar Allen News*, v. 26, Oct. 1947, p. 932-933.

To be continued.

19-372. Deep Drawing of Magnesium. R. G. Gillespie. *Machinery (London)*, v. 71, Oct. 9, 1947, p. 395-403.

Procedures developed during the war.

19-373. The Use of Zinc Alloys for Blanking Dies. *Machinery (London)*, v. 71, Oct. 9, 1947, p. 407-408.

Use by Bristol Aeroplane Co., Ltd. (Condensed from paper by J. W. Sladden and H. S. Walker.)

19-374. Drop Forging. *Metal Industry*, v. 71, Oct. 17, 1947, p. 323-324.

Several problems in the drop forging of light alloys. (Address to the Birmingham Metallurgical Society by F. E. Stokeld.)

19-375. Small Diameter Work Rolls Feature Montgomery Cold Strip Mill. From paper by W. M. McConnell. *Steel*, v. 121, Oct. 27, 1947, p. 88, 90.

Unique roll layout for 20-in. mill. Advantages are accurate gage control, more satisfactory rolling of thin strip along with heavier gages, greater over-all reductions, lower tension, higher deformation efficiency, reduced forward slip and spread, and lower roll pressures. The mill is said to be applicable to high and low-carbon and stainless steel for cold reduction and temper rolling. (Presented at Annual Meeting of A.I.S.E., Pittsburgh, Sept. 22-25, 1947.)

19-376. The Rubber Die Press as a Tool for Forming Aluminum. Part II. E. R. Yarham. *Modern Machine Shop*, v. 20, Nov. 1947, p. 154-156, 158, 160, 162, 164, 166, 168, 170, 172, 174, 176, 178, 180, 182.

Methods of blanking, shearing, flanging, and forming; flanging and flanging tools; bearer blocks; drawing.

19-377. Cold Extrusion of Steel Now Being Investigated for Automotive Use. Robert C. Mack. *Automotive Industries*, v. 97, Nov. 1, 1947, p. 40-41, 68.

German-developed process being investigated by Heintz Mfg. Co., Philadelphia.

19-378. Progressive Die Produces Safety Runway. J. A. King. *American Machinist*, v. 91, Nov. 6, 1947, p. 128-132.

How perforating and embossing die is arranged with mechanical stock feed and several gage bars to control punch action, in production of steel plate for catwalks and platforms, with safety treads.

19-379. The Shaping of Die Forged Parts. *Product Engineering*, v. 18, Nov. 1947, p. 130-134.

A number of practical shaping procedures followed by German industry. The splitting process; forging of hollow parts; simplification of forging procedures by use of cutting and welding; new methods for accurate forming. (Condensed from "Die Gestaltung von Gesenkschmiedstucken" by Hans Maller, *V.D.I. Zeitschrift*, Dec. 25, 1943, p. 809.)

19-380. Adjustable and Demountable Punches and Dies. *Tool & Die Journal*, v. 13, Nov. 1947, p. 82, 86, 88, 92.

Examples made by several different companies.

19-381. Production Processes—Their Influence on Design. Part XXIX—Roll Die Forging. Roger W. Bolz. *Machine Design*, v. 19, Nov. 1947, p. 129-134.

Equipment; methods; applications; design; materials; tolerances.

19-382. Roll Deflection. A. B. Cox. *Machine Design*, v. 19, Nov. 1947, p. 147-150.

Formulas permit calculation of deflection due to bending and shear at any point along a roll. Maximum deflection calculations are simplified by the use of a chart and by reduction to a "mill constant" which is the ratio of maximum deflection to load.

19-383. Shot-Peening Aluminum Forgings. Charles H. Wick. *Machinery*, v. 54, Nov. 1947, p. 133-139.

A relatively new application of shot-peening adopted by Pratt & Whitney Aircraft Div. for strengthening aluminum alloy pistons and crankcase sections.

19-384. Hydrodynamic Method of Drawing and Embossing. *Machinery*, v. 54, Nov. 1947, p. 159-161.

Method of drawing or embossing difficult shapes in one operation is particularly adaptable to the forming of shallow shapes and the drawing of cone-shaped and tapered stampings, but not for the forming or drawing of straight-walled stampings, which can be handled more economically by usual methods on mechanical presses.

19-385. Erfahrungen in der Ausgestaltung von Ziehwagen und Zubehor fur den Mehrstangenzug. (Construction of a Draw Carriage and Accessories for the Simultaneous Drawing of Several Rods.) Karl Wallmann. *Stahl und Eisen*, v. 66-67, April 24, 1947, p. 149-153.

New type of draw carriage for simultaneous drawing of several rods. An increase in production of 80 to 90% in comparison with formerly used equipment.

19-386. Der Derzeitige Stand der Erkenntnisse Ueber Die Mechanischen Vorgange Beim Drahtziehen. (Modern Conception of Mechanical Processes Taking Place During Wire Drawing.) Erich Siebel. *Stahl und Eisen*, v. 66-67, May 22, 1947, p. 171-179.

How to calculate the energy required for deformation, the amount of energy which should be applied for best results, and the stress distribution during drawing. 58 ref.

19-387. Numerische Berechnung der Spannungsverfestigung Beim Kaltrecken und Kaltstauchen. (Numerical Calculation of Improvement of Tensile Strength During Cold Drawing and Cold Working.) H. Brandenberger. *Schweizer Archiv*, v. 13, Aug. 1947, p. 232-238.

Equations and diagrams for calculation of strength properties of notched and plain bars which have been cold drawn or cold worked. The improvement in notched bars is attributed to nonuniform, transverse distribution of stresses. Such improvements are also possible in plain bars in bending or tensile tests. (To be continued.)

19-388. Urceni Razove Prace Zapustkoveho Bucharu. (Determination of Impact Force of Forging Hammers.) Frantisek Drastik. *Hutnické Listy*, v. 2, Sept. 1947, p. 57-61.

Empirical formulas for approximate determination of the impact force of forging hammers for carbon steel and for structural alloy steel, based on number of strokes and projected surface on the joint plane. Size of hammer required for a specific job can be determined from these figures.

19-389. Modern Small Rolling Mills. G. A. Phipps. *Journal of the Iron and Steel Institute*, v. 157, Oct. 1947, p. 247-261.

The layout of a number of different mills of American design and possibilities for future development in Britain.

19-390. Mechanical and Electrical Features of Primary Hot Rolling Mill Auxiliaries. W. W. Franklin and P. F. Grove. *Journal of the Iron and Steel Institute*, v. 157, Oct. 1947, p. 262-278.

Roller tables, bearings, rollers, manipulators, tilting fingers, screwdown gears, bloom shears, mill-type motors. Rating and duty of electric drives for roller tables, breast rollers, manipulators, screwdown and heavy shears, cabling, lighting.

19-391. The Stainless Steels—Fabrication and Heat Treatment After Cold Working. Part III. Lester F. Spencer. *Steel Processing*, v. 33, Oct. 1947, p. 624-629.

Properties of the various types; selection of proper surface finish preliminary to deep drawing or spinning; drawing and spinning equipment and procedures; lubricants; and annealing pretreatments. (To be continued.)

19-392. Light Alloy Rolling. *Metal Industry*, v. 71, Oct. 31, 1947, p. 369.

Abstract of recent B.I.O.S. report on German methods and equipment.

19-393. Hydraulic Forming of Stainless Steel. William C. Brice. *Materials & Methods*, v. 26, Nov. 1947, p. 68-70.

How the problem of necking-in the top of a stainless-steel pail was solved by application of hydraulic pressure to force the metal into the desired shape, using the female die as a sealing unit.

19-394. Shot-Peening of Nonferrous Metals. Harold A. Knight. *Materials & Methods*, v. 26, Nov. 1947, p. 83-86.

Results of experiments which show that above treatment increases stress

(Turn to page 42)

Lead Grids Within Powder Compacts Reveal Deformation, Hence Density

Reported by John Watson

Metallurgist, Link-Belt Co.

Experiments on the use of lead grids in studies of the plastic deformation of metal powders in dies were described by Prof. John Wulff of Massachusetts Institute of Technology before the Indianapolis Chapter ⚙ on Oct. 27.

Dr. Wulff used a very thin lead grid within a powder compact, which may be delineated before and after pressing by X-ray radiography. Such radiographs permit a rapid analysis of deformation—and hence density—throughout the compacts.

Since the grid is placed so it extends from top to bottom of a powder fill across a diameter and parallel to the cylindrical axis of the die, conditions of axial rotational symmetry are obtained. The two-dimensional grid thus positioned permits a three-dimensional measure of deformation. Density within the compact may then be accurately calculated, provided the powder during compression moves vertically and not radially. This was found to be the case when the grid is positioned so as not to touch the die walls and the powder is uniformly distributed around it without "bridging".

Professor Wulff exhibited slides showing density distribution plotted from measurements of grid radiographs. These indicated clearly that in pressing iron and nickel powder, a density maximum occurs near the top circumferential edge of a compact under the movable plunger. A minimum occurs near the bottom circumferential edge adjacent to the fixed plunger in a die. The greater the ratio of height of compact to die diameter the greater the difference in density from top to bottom.

Radial gradients of density also exist. At the top, underneath the movable plunger, the maximum occurs at the center. The latter density for relatively thin compacts may be greater than at the top and as the height of the compact is increased for a given radius the maximum density region is successively at positions closer to the plunger. In no case is the density along the axis ever as great as at the top outer edges. This is due primarily to friction on the die wall and, secondly, to the fact that the top of the compact becomes dense sooner than the bottom and behaves as an extended but differently shaped plunger.

Density gradients formed in pressing are in a large part responsible for distortion of a compact during sintering. How proper die material, finish and lubrication permit reduction of such gradients to a minimum was shown.

In the discussion Professor Wulff pointed out that one of his students has learned how to cast tin around a lead grid and is now using radiography to investigate various metal testing and metal processing methods.

Strain Failures Studied By Hydraulic Flow Analogy

Reported by Knox A. Powell

Research Engineer

Minneapolis-Moline Power Implement Co.

Speaking before a joint meeting of the Northwest Chapter ⚙ and the American Society of Tool Engineers on Oct. 15, Francis G. Tatnall told how engineering can be combined with metallurgy to control stresses and strains in structures. The purpose of the address, according to Mr. Tatnall, who is manager of testing research for Baldwin Locomotive Works, was to promote a simple, direct mode of thinking about stress and strain distribution with a view to eliminating static and dynamic weaknesses.

Modern design, Mr. Tatnall said, is much more concerned with where to omit material than where to add strengthening metal. Mr. Tatnall cited numerous mechanical design, heat treatment, cold work, and chemical action solutions for strain failures that were self-evident when approached by the hydraulic flow analogy.

corrosion of some nonferrous metals such as brass, aluminum, and magnesium, in some cases increasing the life up to 40 times.

19-395. The Massena Works of Aluminum Company of America. *Wire and Wire Products*, v. 22, Nov. 1947, p. 891-894.

Equipment and procedures of plant, especially for aluminum wire drawing.

19-396. The Rolling of Metals: Theory and Experiment. Part XV. (Continued.) L. R. Underwood. *Sheet Metal Industries*, v. 24, Nov. 1947, p. 2199-2205.

Calculation of roll diameters based on effects of various factors; and effects of strip tension on roll load, power requirements, flatness and shape of strip, and gage. (To be cont.)

19-397. Considerations Involved in the Accurate Development of Templets. (Concluded.) A. Dickason. *Sheet Metal Industries*, v. 24, Nov. 1947, p. 2233-2234, 2244.

Complete design calculations and diagrams for development of a templet or blank for the lid of a small rectangular box with rounded corners to be pressed from one piece.

19-398. The Techniques of Drawing. Installment No. VII. James Walker. *Tool Engineer*, v. 19, Nov. 1947, p. 33-41.

Design of dies involving simple and compound operations. Calculation of reduction and of punch and die sizes; selection of aluminum alloys for specific jobs; redrawing; reverse drawing; a two-stage draw die; use of auxiliary holding pressures; and pinch trimming.

19-399. How to Feed Presses. *American Machinist*, v. 91, Nov. 20, 1947, p. 85-100.

Automatic and semi-automatic devices that can be applied to power presses for metal-stamping operations. General construction of feeding mechanisms as well as their limitations and possible production rates.

For additional annotations indexed in other sections, see:
24-356; *27*-241.

20 MACHINING AND MACHINE TOOLS

20-611. Machine Tools in Carbide Tool Plant. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 86-87.

Equipment for regrinding, resharpening, and manufacture of carbide tools.

20-612. Shop Kinks. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 110.

Lathe centers (reconditioning). Adjustable arbor. Combination boring tool holder.

20-613. Report of Committee on Shop Tools. *Railway Mechanical Engineer*, v. 121, Oct. 1947, p. 580-583.

Increasing use of carbide tools for the machining of locomotive parts emphasizes need for modern machine tools of proper design and sufficient capacity. (Presented at Locomotive Maintenance Officers' Meeting, Chicago, Sept. 15-18, 1947.)

20-614. A Low Cost Drilling Jig. *Materials & Methods*, v. 26, 1947, p. 122.

20-615. Turbine-Blade Milling. *Aircraft Production*, v. 9, Oct. 1947, p. 381.

New hydraulically controlled machine tool.

20-616. Turning and Milling. *Aircraft Production*, v. 9, Oct. 1947, p. 396-397.

Some developments in carbide cutting-tool practice.

20-617. Planned Production. *Screw Machine Engineering*, v. 8, Oct. 1947, p. 36-39.

Advantages of using attachments to produce a completed part and also stresses many fine points in screw-machine tool design and layout. Details of the manufacture of a complex screw-ended shaft.

20-618. Loading Work With the Slotting Attachment Transfer Arm. L. W. Richhart. *Screw Machine Engineering*, v. 8, Oct. 1947, p. 42-44.

The completion of screw-machine products by utilizing the automatic as a secondary operation machine. Four distinct advantages are obtained by this method of tooling. Method as applied to a specific part calls for the transfer arm of the slotting attachment being used as a loading station, thus making it possible to transfer the part to the work collet without stopping the machine.

20-619. Computing Lead Cam Cut-Down. Herbert W. Smith. *Screw Machine Engineering*, v. 8, Oct. 1947, p. 45-47.

Procedure utilizing paper or cardboard dummies representing the body length of each turret tool holder. These dummies are used in conjunction with a full-scale drawing of the part in position at the work spindle with allowance for cut-off width and clearance to the collet face.

20-620. Broader Spindle Speed Ratios for No. 00 Regular Brown & Sharpe Automatics. *Screw Machine Engineering*, v. 8, Oct. 1947, p. 48-52.

Threading nickel, nickel-chromium, or stainless steel requires a low surface speed, while the forming and cutting-off operation requires a comparatively high surface speed. The desired combination of spindle speeds cannot be obtained by usual procedures. Three cam layouts for alleviating the difficulty.

20-621. Stock Ends. *Screw Machine Engineering*, v. 8, Oct. 1947, p. 61.

Counterbore with knee tool, by Maurice C. Ohl. Variation in over-all length of parts, by Michael Gibsman. Turret stops, by John G. Ozga.

20-622. The Production of Fuel Injection Nozzles. *Machinery (London)*, v. 71, Oct. 2, 1947, p. 367-374.

Methods used at English factory.

20-623. Optical Profile Grinder. *Machinery (London)*, v. 71, Oct. 9, 1947, p. 404-405.

Machine produced by Ultra Prazisionswerk at Aschaffenburg incorporates an optical system which was supplied by Leitz of Wetzlar. It is designed for finishing the forms of accurate templets, straight and circular form tools, and other profiled work, the contour of the work being compared with an enlarged drawing as the operation proceeds.

20-624. Cooling Large Workpieces During Centerless Grinding. *Machinery (London)*, v. 71, Oct. 9, 1947, p. 406-407.

A grinding test which shows that with increasing contact area the usual ccolant arrangement becomes unsatisfactory. Diagram shows the coolant-supply system which remedied the difficulty.

20-625. Automatic Milling Machines Solve Spar Cap Production Problems at Douglas. V. C. Fergen and C. R. Wulffsohn. *Automotive Industries*, v. 97, Oct. 15, 1947, p. 38-40.

Use for molding of main internal beams or spar caps from single billets of aluminum-alloy material.

20-626. Cranky Shapes Yield. *American Machinist*, v. 91, Oct. 23, 1947, p. 106-108.

Gear shapers can be set up to handle many odd-shaped pieces, for instance: irregular cams, square holes, multiple holes, cone-shaped ends, hourglass shapes, interrupted surfaces, irregular shaped pawls, taper surfaces, jaw-tooth clutches.

20-627. Short Cuts for the Small Shop. A. H. Waychoff. *American Machinist*, v. 91, Oct. 23, 1947, p. 112.

Trays for small parts are easily made from fruit-juice cans; chips can be removed efficiently from die stocks by placing them on top of a strong magnet; and a burnt hand and spilled babbitt can be prevented by applying a sliding grip to the ladle handle.

20-628. Tolerance Charts Forecast Accuracy. James K. Matter. *American Machinist*, v. 91, Oct. 23, 1947, p. 114-118.

Use of tolerance charts to examine a series of machining operations planned for a given part in order to determine whether or not the part will reach the end of the last operation with the desired dimensions and tolerances.

20-629. Practical Ideas. *American Machinist*, v. 91, Oct. 23, 1947, p. 119-124.

Compound punch and die makes three washers, by Burnett Menkin. Bunsen aids small brazing, by Norman Laycock. Form turning attachment, by Donald A. Baker. Lathe fixture slots screws, by George Burnley. Brake prevents kick-back, by Thomas H. Duffy. Centering diamond wheels, by Norman Ingalls. Carbide scriber, by Frank A. Bynum. Compass attachment, by James D. Cuyler. Drill press reams gear blanks, by James Broderick. Carriage lever operates old lathe, by K. Wysocki. Shaper doubles as punch press, by Felix J. Zagumny. Tapered key fitting, by U. Wheatley. Hand burr, by T. C. Clark. Lens spanner, by George Burnley. Trade mark stamper, by Stephen M. Lounsberry. Colleted faceplate has quick lock, by Richard E. Stern. Acme thread cutting, by Frank H. Schwerin. Removing taper pins; by Henry Smith. Coupling feeds tailstock, by Allan B. Nixon. Steadyrest aids long slot milling, by H. Moore. Light beam spots hole center, by Lawrence L. Hausman. Low-cost turret, by C. W. Pressey. Irregular part holder, by A. D. N. Scott. Swaging eliminates welding, by George Thomas.

20-630. Special Tooling for Servel Gas Refrigerators. Gerald Eldridge Stedman. *Modern Machine Shop*, v. 20, Nov. 1947, p. 124-128, 130, 132.

Some of the special tools that have been designed by Servel tool engineers.

20-631. Ideas From Readers. *Modern Machine Shop*, v. 20, Nov. 1947, p. 244, 246, 248, 250, 252, 254, 256, 258, 260.

Sphere turning to close limits, by William E. Welch. Milling coiled stock, by John E. Hyler. Handy measuring tool, by D. E. McDonald. Stud removing simplified.

20-632. Short Cuts for the Small Shop. A. H. Waychoff. *American Machinist*, v. 91, Nov. 6, 1947, p. 97.

Hand-tap lubrication; cleaning and tinning of soldering irons; lathe dog for soft metals; hand vise for thin stock.

20-633. Dial Feeds Synchronized by Air. Joseph F. Budnick. *American Machinist*, v. 91, Nov. 6, 1947, p. 101-103.

Use of air systems for synchronizing dial feeds for small parts and controlling work at each station in small-part assembly.

20-634. Ideas That Save Planer Time. J. J. Madden. *American Machinist*, v. 91, Nov. 6, 1947, p. 104-105.

Some new ideas which result in large time savings in manufacture of printing-press beds and side frames.

20-635. Ford Throws Out Filter Bags. Rupert Legrand. *American Machinist*, v. 91, Nov. 6, 1947, p. 126-127.

New centralized filtration system for removing chips from grinding coolant. Cost comparison shows 96.5% savings in operating expense.

20-636. Practical Ideas. *American Machinist*, v. 91, Nov. 6, 1947, p. 135-140.

Multiple drilling attachment handles many different jobs, by W. H. McCullough. Vise permits fast lathe boring, by Lawrence L. Hausman. Radius gage. Mandrel squares thin

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Editor Warns Of Communism In France & Italy

Reported by A. Waydak

Engineering Dept., Chevrolet Motor Co.

"We are engaged in a war with Russia right now—a war of propaganda and ideals" was the sobering statement made by T. W. Lippert, directing editor of *Iron Age*. Back from a recent survey of European industrial potentials, Mr. Lippert spoke to the Saginaw Valley Chapter ⊕ at its October meeting at Frankenmuth, Mich.

He told of authoritative predictions that General Charles DeGaulle would attempt to gain power in France within two months, either by constitutional means or by use of force.

"Italy may well go communistic by the turn of the year, making France very susceptible to Red influence. If Russia were to control France and her empire (directly or indirectly), it would give her world-wide bases", he warned. "It would then be easy for the Reds to take over Belgium and the Belgian Congo, which was the source of all the uranium that was used for the atom bomb."

"The Marshall Plan is the first time that American foreign policy has been on the offensive," he said. "We must do all we can, just short of war, to balk the Russians, and we can't carry on this fight and have lower taxes."

Sharply critical of our American policy in Germany, Mr. Lippert said, "There is not a single top-ranking officer with our occupation troops who has had experience in heavy industry, yet these men are running German production. We are not making any friends there."

Commenting on business in America, he blamed the high cost of living on the great wartime destruction of wealth which exceeded all that we had accumulated in our entire history. "The last nine years have been the longest in our history that business has steadily risen," he stated, "but a recession is already partly under way. Even the automobile industry, which confidently expects a seller's market for several more years, may discover the buyer in the saddle long before that time." He does not expect much more inflation, but said that prices would never drop much below current levels.

This meeting was designated as "Past Chairmen's Night" and Chairman M. J. Caserio presented a past chairman's certificate to A. H. Karpicke, who had held this post during the 1946-1947 season.

Wartime Experience in Gun Production Recounted

Reported by Harold W. Schmid

Vice-President, General Metals Corp.

"Gun Production Problems During World War II" proved to be an interesting subject when presented by D. J. Martin before the November meeting of the Texas Chapter ⊕ in Houston on Nov. 4. Wartime experience as a colonel in the Office of the Chief of Ordnance gave Dr. Martin, who is now an executive for Hughes Tool Co., a wide experience and first-hand knowledge of the subject.

Points covered were the rapid expansion of sources supplying rough barrels and machine work, problems encountered in securing an adequate inspection program, and the development of centrifugal castings for small and medium caliber gun tubes.

Copper Properties Reviewed

Reported by H. P. Weinberg

Virginia Polytechnic Institute

The unusual properties of copper, brass and bronze which give them certain advantages over other metals were stressed by Ira T. Hook, research engineer for the American Brass Co., speaking before the V. P. I. Chapter ⊕ on Nov. 3. The speaker also pointed out that our supply of copper ores is becoming smaller and that we should do all in our power to use our copper resources wisely.

During the meeting, moving pictures on copper mining in Chile and Arizona were shown.

blanks, by Donald Campbell. Piercing die used in vise, by Gustav A. Soderberg. Saving stripped threads, by Eugene W. Dunlap. Cutoff stop, by Sam Bendick. Spirit level Tee guides hand drill, by Edwin A. Hoppe. Indicator tests right angles, by Gerhard Wenke. Die holder, by Al Sobozak. Spherical grinding. Spot facer trues seats, by E. L. Clark. Jig counterbore has micrometer nonslip depth adjustment, by H. Moore. Crush dressing, by Willet Kilbank. Wide-step jaws hold thin rings and tubes, by Robert Mawson. Universal clamp extends surface gage applications, by Homer Tate. Making a symmetrical die casting die cavity, by Robert J. Lachow. Form cutters, by C. Clarke. Cam jig, by Donald Campbell. Emergency taps.

20-637. The Manufacture of Fuel Pump Elements. *Machinery (London)*, v. 71, Oct. 16, 1947, p. 423-431.

Methods used at a British plant.

20-638. Self-Centering Reaming Fixture for Spinning Caps. *Machinery (London)*, v. 71, Oct. 16, 1947, p. 435.

Precision reaming tool for production of parts used in textile-manufacturing machinery.

20-639. Reconditioning Cutting Tools for Maximum Efficiency. H. A. Frommelt. *Steel*, v. 121, Nov. 10, 1947, p. 102-105, 131, 134.

How to avoid machining trouble by applying latest tested and approved cutter-grinding methods.

20-640. Design Aspects of the Machine Tool Show. Roger W. Bolz. *Machine Design*, v. 19, Nov. 1947, p. 113-116.

20-641. Cutting Costs With High-Cycle Electric Portable Tools. F. J. Hejduk. *Machinery*, v. 54, Nov. 1947, p. 140-143.

Advantages and typical applications on different classes of work.

20-642. Machining Ford Carburetor Die Castings. Herbert Chase. *Machinery*, v. 54, Nov. 1947, p. 144-148.

Machining setups and fixtures at Ford's Milford, Mich., plant.

20-643. Tool Engineering Ideas. *Machinery*, v. 54, Nov. 1947, p. 169-171.

Determining the developing angles for circular forming tools, by Fritz L. Keller. Cam-operated air vise, by Mark W. Purser. Turning thin-walled bushings with a single-point tool, by Donald A. Baker.

20-644. Pneumatic Fixture Simplifies Broaching. *Compressed Air Magazine*, v. 52, Nov. 1947, p. 281.

Air-operated eccentric fixture developed by Colonial Broach Co. for service in connection with 10-ton hydraulic press, for broaching keyway slots in heavy-duty steering knuckles.

20-645. Improvement in the Geometry of the Cutting Tool. I. M. Neklepaev. *Industrial Power (U.S.S.R.)*, v. 4, Sept. 1947, p. 8-10. (In Russian.)

Changes in the profile of cutting tools which are claimed to result in superior performance.

20-646. Cutting Tools for Brass. George F. Wheeler. *Production Engineering & Management*, v. 20, Nov. 1947, p. 51-55.

Various special-purpose tools used to good advantage in machining brass castings, forgings, and bar stock.

20-647. Carbide Tips Lower Machine Downtime. *Production Engineering & Management*, v. 20, Nov. 1947, p. 55.

Manufacture of split-bolt connectors from special free-cutting bronze.

20-648. Ingenious Fixtures Increase Efficiency of Machine Tools. *Production Engineering & Management*, v. 20, Nov. 1947, p. 66-74.

Various fixtures and procedures used in production of outboard motors. Efficiency has been improved by volume producing in one plant all of certain parts required for assembly work in the other four plants.

20-649. The Crib. *Production Engineering & Management*, v. 20, Nov. 1947, p. 83.

An adjustable square, by Kurt L. Wohlgemuth. A better adhesive, by Edward Diskavich. Repairing compasses, by A. E. Lawrence.

20-650. Automatic Hob and Helical Spline Grinding Machine. *Industrial Diamond Review*, v. 7, Oct. 1947, p. 308-309.

British-made machine tool.

20-651. Fine Boring Machine for Half-Bearings. *Industrial Diamond Review*, v. 7, Oct. 1947, p. 309.

British-made machine tool for producing high-surface-finish half-bearings with high dimensional accuracy.

20-652. Air Control for Machining Die Castings. *Die Castings*, v. 5, Nov. 1947, p. 58-62.

Equipment and procedures for "free" facing operation; synchronized multi-operation; four operations on die-cast zinc shock-absorber piston, including beveling, facing, flash removal, and a broaching inspection; finish reaming two holes; threading a burner; broaching four surfaces; and three operations on a valve.

20-653. Modern Tooling Techniques. *Screw Machine Engineering*, v. 9, Nov. 1947, p. 39, 42-46.

Tooling for production of 2.32 x 0.35-in. complex part on a 1¼-in. model-601, New Britain, automatic screw machine.

20-654. Loading Parts From Rear of the Spindle for Secondary Operation Work. *Screw Machine Engineering*, v. 9, Nov. 1947, p. 47-51.

Loading device utilizes the bore of the spindle for feeding the parts and loading the work collet. This type of loader particularly lends itself to long parts which, when butted together, resemble a bar of stock.

20-655. Burnishing Tools and Holders. *Screw Machine Engineering*, v. 9, Nov. 1947, p. 52-53.

Use of the multiple-spindle automatic.

20-656. Tooling Methods for Brown & Sharpe Automatics. *Screw Machine Engineering*, v. 9, Nov. 1947, p. 54-57.

Tooling and camming arrangement which eliminates burrs from the heads of two different angular-headed screws, and also results in 60% increase in production over usual methods.

20-657. A New Concept in the Field of Abrasives. A. Albert Klein and Gordon T. Rideout. *Tool Engineer*, v. 19, Nov. 1947, p. 17-23.

A new alpha-alumina abrasive and its manufacture by separate crystallization of individual grains. Applications and advantages.

20-658. The Machine Tool Show in Review. A. E. Rylander. *Tool Engineer*, v. 19, Nov. 1947, p. 24-32.

Verbal sketches and pictorial displays of Chicago show.

20-659. Movement Between Work and Locator. Hans W. Smith. *Tool Engineer*, v. 19, Nov. 1947, p. 41.

Locators in bores are frequently relieved on the sides to permit minor movement of the work in the relieved direction while holding the work close on the unrelieved part of the diameter. Calculation of the amount of movement permitted by the locator.

20-660. Better Holes With Solid Carbide Boring Tools. *Tool Engineer*, v. 19, Nov. 1947, p. 48.

Difficulties in holding desired tolerances (0.0002 in. to 0.00005 in.) when boring ⅞-in. cylinder holes in the bronze bodies of hydraulic pumps were overcome by the use of solid Carboloy cemented-carbide boring bars.

20-661. Cast Alloys Vary in Cutting Efficiency. J. B. Dym and T. Badger. *American Machinist*, v. 91, Nov. 20, 1947, p. 109-111.

Results of extensive investigation of tool breakdown, life, speed and feed change, interrupted cuts, and tool grinding, which showed wide variation between materials and excellent results by proper use.

20-662 Practical Ideas. *American Machinist*, v. 91, Nov. 20, 1947, p. 119-124.

Fabrication of twisted-link welded steel chains, by N. Malmgren. Fast chamfering method for brass plates, by Bernard Levowich. Built-up embossing dies from plate stock to save money, by Raymond F. Ball. Hole layout on small rectangular blocks, by George A. Filepas. Reciprocating countersink burrs cylindrical work, by Dana J. Mulholland. Cone gage sets tailstock, by Roy C. Van Kirk. Longitudinal long radii turned with A-frame, by Henry George. Micrometric divider compass for precision circles, by George A. Giller. Drillpress attachment for heavy tapping, by L. S. Rowland. Multiple-spindle drill-head powered by lathe faceplate, by George W. Dahl.

For additional annotations indexed in other sections, see: 2-259; 3-353; 24-352-374; 27-241-251.

21 LUBRICATION and Friction; Bearings

21-97. Automotive Bearings From the Service Viewpoint. H. W. Luetkemeyer. *SAE Quarterly Transactions*, v. 1, Oct. 1947, p. 612-616, 625.

The three primary causes of bearing failures are listed as extreme increases in rated engine output without fundamental design changes, improper installation, and more severe use of the engine than its design permits. Advances leading to increased performance of many engine parts. Factors which affect bearing capacity, performance, and life. Bearing installation procedure. (Presented at S.A.E. National Transportation Meeting, Chicago, April 18, 1947.)

21-98. Lubrication in Iron and Steel Works Engineering. H. J. Knight. *Blast Furnace and Steel Plant*, v. 35, Oct. 1947, p. 1235-1240.

Information obtained on trip to America. (Paper read before British Iron and Steel Institute.)

21-99. Lubrication in Drawing Operations—A Symposium. E. A. Evans, H. Silman, and H. W. Swift. *Sheet Metal Industries*, v. 24, Oct. 1947, p. 1995-2002.

The functions and requirements of lubricants for drawing and properties of the different types. Results of an experimental comparative test program for different lubricants. (To be continued. Presented at Autumn Conference of Sheet and Strip Metal Users' Technical Assoc.)

21-100. Lubrication of Grinding Machinery. A. F. Brewer. *Steel*, v. 121, Oct. 27, 1947, p. 74-76, 95-96.

Lubricating systems and selection of lubricants.

21-101. Two Heat Resisting Lubricants. G. L. Sumner. *Westinghouse Engineer*, v. 7, Nov. 1947, p. 188-189.

Molybdenum sulphide and boron nitride have achieved success alone and in combination with other materials in solving problems of lubrication of moving parts subjected to elevated temperatures.

21-102. What to Look for in Hydraulic Oils. I. Anthony J. Zino, Jr. *American Machinist*, v. 91, Nov. 6, 1947, p. 93-96.

Six service properties which must be considered in selecting oils for satisfactory results are: viscosity; viscosity index; demulsibility; oxidation stability; lubricating value; rust and corrosion preventive qualities.

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Vexing Details Complicate Casting Of Jet Engine Parts

Reported by H. W. Schmid

Vice-President, General Metals Corp.

While the basic principle involved in the production of power and thrust by the turbo jet engine is extremely simple, many details complicate its practical application. These details were elaborated upon by H. H. Harris, president of General Alloys Co., before the Texas Chapter ⊕ in October.

Mr. Harris emphasized the necessity for close liaison between the designing engineers and the metallurgical personnel in the successful solution of vexing details in the manufacture of components. Manufacture of compressor rotor wheels and turbine rotor wheels, for example, which are sufficiently uniform so that service life can be predicted, appears to be far from solution.

Mr. Harris illustrated various methods of producing these parts and pointed out the advantages and shortcomings of each. In the lost-wax method of producing blades the extreme service requirements entail a problem with respect to duplicating metallurgical conditions as to temperature of pouring and consequent duplication of optimum grain size. Fabrication either by casting or by forging from rolled billets or bars is complicated by the difficulties in melting, pouring and forging materials which have relatively high strength at elevated temperatures.

Manufacture of heat resisting alloys for general applications was also covered briefly, and Mr. Harris showed a number of specific parts and gave data on their service life.

Graphite Flake Structure Affects Cast Iron Properties

Reported by John F. Collins

O'Brien Fellow in Metallurgy
University of Notre Dame

The main difference between the microstructure of gray cast iron and steel is the presence of graphite flakes in the cast iron, according to James T. MacKenzie, technical director of the American Cast Iron Pipe Co. The desirable properties of gray cast iron are due almost entirely to these graphite flakes. Dr. MacKenzie addressed the November meeting of the Notre Dame Chapter ⊕ on "Engineering Properties of Cast Iron".

Graphite flakes account for the self-lubricating properties of cast iron, as well as its good machinability. Better wear resistance is obtained with coarse graphite flakes in a pearlitic matrix than with fine flakes in a ferritic matrix, Dr. MacKenzie pointed out.

Inoculation of cast iron consists in the addition of small amounts of an element in the ladle, that are not sufficient to affect the composition appreciably. Dr. MacKenzie believes inoculation to be a local enrichment effect. Silicon added in this manner causes the nucleation of graphite, which has a tendency to avoid chills in a casting.

The physical properties of cast iron can be modified by heat treatment in a manner similar to those of steel.

C. F. & I. Promotes Three

Irving L. Herts has been appointed superintendent of the newly created production planning and shipping department of the Colorado Fuel & Iron Corp., Pueblo, Colo. Mr. Herts has been with C. F. & I. since 1906 in various finishing and shipping supervisory capacities, and since 1928 has been assistant superintendent of the order and shipping department. Mr. Herts is chairman of the Pueblo Group, Rocky Mountain Chapter ⊕.

Hal Sorenson will be assistant superintendent of the production planning and shipping department, and his former position of general foreman of the wire mill scheduling, shipping and stockkeeping section will be taken by C. J. Vidmar. Mr. Vidmar is secretary of the Pueblo Group, and Mr. Sorenson is on the membership committee.

21-103. Methods of Wear Testing of Bearing Alloys on the Amsler Machine. M. Kh. Drits. *Factory Laboratory (U.S.S.R.)*, v. 13, June 1947, p. 757-760. (In Russian.)

Experiments on the effects of surface cleanliness, lubrication, duration of test, and pressure applied, on coefficient of friction and wear of various standard bearing alloys.

21-104. Friction at High Sliding Velocities. Robert L. Johnson, Max A. Swikert, and Edmond E. Bisson. *National Advisory Committee for Aeronautics Technical Note No. 1442*, Oct. 1947, 41 p.

Fundamental friction knowledge extended to include sliding velocities encountered in rolling-contact bearings and reduction gears of aircraft power plants. Experiments were conducted with a kinetic-friction apparatus consisting basically of an elastically restrained spherical rider sliding on a dry or lubricated rotating disk with steel specimens over a range of speeds between 50 and 6600 ft. per min. with loads from 108,000 to 255,000 psi. initial Hertz surface stress. Experiments were supplemented by standard physical, chemical, and metallurgical equipment and techniques. 18 ref.

21-105. Changes Found on Run-In and Scuffed Surfaces of Steel, Chromium Plate, and Cast Iron. J. N. Good and Douglas Godfrey. *National Advisory Committee for Aeronautics Technical Note No. 1432*, Oct. 1947, 28 p.

X-ray and electron-diffraction techniques, microhardness determinations, and microscopy were used. Surface changes were found to include three classes: chemical reaction, hardening, and crystallite-size alteration. 24 ref.

21-106. Selecting the Antifriction Bearing for a Limited Space. *Electrical Manufacturing*, v. 40, Nov. 1947, p. 82-86, 156, 158, 160.

Selection of ball and roller bearings.

21-107. Lubrication in Drawing Operations; a Symposium. (Concluded.) E. A. Evans, H. Silman, and H. W. Swift. *Sheet Metal Industries*, v. 24, Nov. 1947, p. 2209-2213, 2216.

Gives results of evaluation of different lubricants for drawing of mild steel, brass, and aluminum. Various chemical methods for degreasing or surface preparation. The electrocleaning process. (Presented at the Autumn Conference of the Sheet and Strip Metal Users' Technical Assoc.)

For additional annotations indexed in other sections, see:
6-276-283; 9-162.

22 WELDING
Flame Cutting; Riveting

22-607. Uniting Wood and Metal: Plymetl. *Modern Metals*, v. 3, Oct. 1947, p. 42.

Properties and applications of "Plymetl". Light-metal sheets are bonded to both sides of plywood panels by a special undisclosed bonding agent.

22-608. Welding Applications in Ore Bridges. George F. Wolfe. *Iron and Steel Engineer*, v. 24, Oct. 1947, p. 84-85.

Construction, for the first time, of an ore bridge with all components welded except the main truss and cantilever spans.

22-609. Unique Canadian Contributions to Oxygen Cutting. R. A. Dunn. *Canadian Metals & Metallurgical Industries*, v. 10, Oct. 1947, p. 16-19.

Several new techniques developed in Canada during the war for specific purposes in mass production.

22-610. The Spot Welding of Dissimilar Aluminum Alloys in the 0.040-In. Thickness. W. F. Hess, R. A. Wyant, and F. J. Winsor. *National Advisory Committee for Aeronautics Technical Note No. 1322*, Oct. 1947, 37 p.

Reports on research being conducted at Rensselaer Polytechnic Institute, covering eight combinations. In many instances the chemical treatment of dissimilar alloys prior to spot welding is a less difficult problem than the treatment of some similar alloy combinations.

22-611. The Flash Welding of Hard Drawn High-Carbon Steel Wire. R. W. Bennett and R. D. Williams. *Mines Magazine*, v. 37, Oct. 1947, p. 12-20.

Reprinted from *Welding Journal*, Oct. 1946.

22-612. Welding of Boilers and Tenders. *Railway Mechanical Engineer*, v. 121, Oct. 1947, p. 569-572.

Applications of welding and cutting in the boiler shop for the fabrication of new parts and the removal of old ones. (Presented at Meeting of Master Boiler Makers' Association, Chicago, Sept. 15-18, 1947.)

22-613. Argon-Shielded Metal-Arc Welding of Aluminum. Gilbert C. Close. *Light Metal Age*, v. 5, Oct. 1947, p. 6-9.

Development for edge welding of the reinforcement strap over the butt welds holding the various sections of liquid oxygen tanks together, a problem that defied solution by conventional gas or arc welding methods.

22-614. Arc Welding in Furnace Making. *Sheet Metal Worker*, v. 38, Oct. 1947, p. 90.

Procedures in plant of Waterman-Waterbury Co., Minneapolis.

22-615. Refrigerator Evaporators Brazed in Automatically Controlled Furnaces. *Industrial Heating*, v. 14, Oct. 1947, p. 1594, 1596, 1598.

22-616. Welding Railroad Passenger Cars. Part I. Arthur M. Unger. *Welding Engineer*, v. 32, Oct. 1947, p. 44-48.

Some of the novel and ingenious welding techniques developed for the underframe and side frames of passenger cars. Submerged-melt welding is extensively used. (To be continued.)

22-617. Brazing Three-Piece Assembly With Induction Heating Unit. *Machinery*, v. 54, Oct. 1947, p. 168.

Method used to join three assembled parts of a lawn mower—the spider, drive-shaft, and bearing retainer.

22-618. A Brief Review of Brazing Processes. H. R. Brooker. *Sheet Metal Industries*, v. 24, Oct. 1947, p. 2041-2045.

History; brazing materials; requirements of fluxes; types of flux; flux application; and joint design and performance. (To be continued. Presented at Autumn Conference of Sheet and Strip Metal Users' Technical Assoc.)

22-619. Factors Affecting the Choice of Metal Joining Processes. J. L. Miller. *Sheet Metal Industries*, v. 24, Oct. 1947, p. 2051-2057, 2061.

Advantages and limitations of the various joining methods: soft soldering; riveting; copper brazing; silver soldering; different types of welding.

22-620. The Welding of Nonferrous Metals. Part VIII. The Welding of Copper and Its Alloys. (Concluded.) E. G. West. *Sheet Metal Industries*, v. 24, Oct. 1947, p. 2058-2061.

Copper-nickel alloys and other copper-rich alloys. (To be continued.)

22-621. The British Welding Research Assoc.'s Symposium on the Welding of Light Alloys. Aluminum Alloys for Gas Welding With Special Reference to Aluminum-Silicon-Copper Alloys. J. Pendleton and E. A. G. Liddiard. *Sheet Metal Industries*, v. 24, Oct. 1947, p. 2062-2066, 2068.

The welding behavior of aluminum alloys containing from 2½ to 5% Cu plus 5 to 10% Si and the impurities normally associated with either commercial-purity aluminum or secondary aluminum alloys was compared with the welding behavior of other aluminum alloys. Mechanical properties and heat treatment of the aluminum-5% Si-2½% Cu alloy in the wrought and cast conditions.

22-622. Bonding Sapphire to Metal. T. C. Du Mond. *Materials & Methods*, v. 26, Oct. 1947, p. 84-86.

Sapphire can be soldered or brazed to metal parts by a new bonding process which promises to extend the usefulness of this material in such products as gages, hand tools and cutting tools.

22-623. Welding and Flame Cutting Applied to Stainless and Clad Steels. S. F. Danes. *Materials & Methods*, v. 26, Oct. 1947, p. 102-106.

Use of above in fabrication of a "Hydrapulper" (a unit 12 ft. in diameter and nearly 8 ft. high). The fundamental design is not new, but the fabrication methods are.

22-624. Where and How to Use Controlled Hydrogen Electrodes. Orville T. Barnett. *Industry and Welding*, v. 20, Oct. 1947, p. 26-29, 74-77.

How and why E6015 electrodes operate and the technique for using them.

22-625. Heliarc Welding Magnesium, Stainless, Aluminum at Northrup. H. C. Eubank and T. E. Piper. *Industry and Welding*, v. 20, Oct. 1947, p. 30-32, 34, 78.

Some of the "know-how" of the above accumulated as a result of experience in the fabrication of aircraft.

22-626. Stop Those Welding and Cutting Fires. G. R. Webster. *Industry and Welding*, v. 20, Oct. 1947, p. 38-39, 44, 46, 90-92.

Recommended safety precautions.

22-627. Resistance Welding Review. C. M. Manzer. *Industry and Welding*, v. 20, Oct. 1947, p. 79-81.

One year's progress.

22-628. White Metal Welding. *Linde Tips*, v. 26, Oct. 1947, p. 109-112.

Hints for successful repair of die castings.

22-629. Shape-Cutting Setup. *Linde Tips*, v. 26, Oct. 1947, p. 114.

How to make a small shape-cutting machine where accuracy requirements are not too exacting.

22-630. Portable Shop Table. *Linde Tips*, v. 26, Oct. 1947, p. 118.

Welding and cutting table.

22-631. Practical Kinks on How to Make It. *Linde Tips*, v. 26, Oct. 1947, p. 119.

Cylinder stand; anvil base; spark arrester; key drift; work support; welding light tubing.

22-632. Let Contraction Do the Heavy Work. *Linde Tips*, v. 26, Oct. 1947, p. 124-125.

How to remove distortion which took place during welding, by proper use of the oxy-acetylene flame.

22-633. Storage Battery Work. *Linde Tips*, v. 26, Oct. 1947, p. 129-130.

Maintenance and repair by lead welding.

22-634. Problems in Resistance Welding Stainless Steel Railway Car Structures. J. H. Van den Beem. *Welding Journal*, v. 26, Oct. 1947, p. 837-843.

Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.

22-635. Shunt Circuit Impedance in Spot Welding ⅛, ¼ and ½-In. Mild Steel. Robert H. Blair. *Welding Journal*, v. 26, Oct. 1947, p. 843-848.

In spot welding parts where more than a single weld is used, it is known that contiguous welds frequently do not have the same shear strength as the initial welds. This is due to the fact that the initial weld provides a shunt current path around the con-

(Turn to page 48)

Machinability Like Quadratic Equation With Many Variables

Reported by H. L. Millar

Discussing the very practical subject of "Heat Treating for Machinability" before the October meeting of the Los Angeles Chapter, Fred J. Robbins, vice-president and technical director, Plomb Tool Co., Los Angeles, likened the problem of machinability to a quadratic equation of a high degree with no complete solution on account of the large number of variables which cannot be fixed or eliminated. According to Mr. Robbins's definition, "the most machinable steel is the one which will permit the fastest removal of the greatest amount of material (without resharpening the tool) with a satisfactory finish".

Many variables occur as conditions of machinability differ from shop to shop. These are: kind of cutting fluid, type of machine, spindle speed, cutting speed and feed, type of cutting tools, how ground, by whom ground, clearance angle, grade of steel being machined, hardness of steel, annealed structure, steelmaking practice, deoxidation practice, and—no less important—sobriety of the machine operator.

From the metallurgical point of view the requirements for good machinability, according to the speaker, are low tensile strength for easy rupture of the chip and low ductility for brittleness in the chip. Since these properties are exactly opposite there must be a compromise.

Plain carbon steel may be classified as to machinability in four groups. Low-carbon steels with low tensile strength, high ductility, and low hardness possess poor machinability. Optimum machinability is obtained in the range of 0.28 to 0.35% carbon known as the mild steel grade. With still higher carbon (0.35 to 0.55%) increased tensile strength and hardness and decreased ductility necessitate that the steel be annealed according to a definite cycle. The higher carbon grades (0.75 to 1.05%) must be fully spheroidized before machining.

Sulphur and phosphorus improve machinability by causing discontinuities in the steel, but also promote brittleness and poor mechanical properties if added too liberally. Reviewing the four basic groups in alloy steels, Mr. Robbins showed the necessity for thermal treatment in carbon ranges lower than for plain carbon steels. Solution-forming alloys are hard to machine, carbide-forming alloys easier.

Thermal treatment of steels that are too hard to machine is twofold, the speaker explained—first, to produce throughout an entire lot of steel a uniformity of structure most suitable for the particular machine operation, and second to reduce hardness.

Illustrating his points with slides of data and microstructures, Mr. Robbins concluded that the degree of uniformity is more important than structure.

Technical Papers Invited

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1949 *Transactions*. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society. Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 30th National Metal Congress and Exposition to be held in Philadelphia, Oct. 25 to 29, 1948. Papers that are selected for presentation at the Convention will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 15, 1948.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

Lists Four Factors That Control Forging Quality

Reported by Henry Hauseman

Metallurgist
LaPlant-Choate Mfg. Co., Inc.

"Forging for Better Metal Performance" was the subject of a technical talk presented by C. A. Furgason, metallurgist for the Ladish Co., before the Cedar Rapids Chapter on Oct. 14.

The selection of analyses, inspection of raw material, control of metal flow, and good heating equipment are the important factors which control the quality of forging, he said. Forging increases metal performance by increasing ductility.

With the assistance of some excellent slides, the speaker described the latest trends in new heating and forging equipment. Another series of slides illustrated typical metal failures, their causes, and the methods used to eliminate them.

Raw materials should be closely inspected for soundness prior to forging so as to eliminate costly scrap, the speaker emphasized. Among the newer inspection tools, the Sperry Supersonic Reflectoscope is particularly useful for locating internal defects in forging bars and billets. This rapid and nondestructive method for inspection of forging stock enhances the quality control of the finished product.

tiguous weld. Results of an experimental investigation of this phenomenon. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-636. Integral Bosses for Pressure Vessels. H. L. Anthony and H. P. Schane. *Welding Journal*, v. 26, Oct. 1947, p. 849-859.

Photographic, photomicrographic, and other data demonstrate the advantages of integral bosses (threaded openings, studs and other parts simultaneously cast and welded into position) for thin-wall pressure vessels such as hot water boilers. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-637 Engineering Symposium of Future Control of Resistance Welding Machine. C. E. Smith. *Welding Journal*, v. 26, Oct. 1947, p. 860-866.

Present status and future trends. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-638. Development of Butt Welded Joints in Pressure Vessels. Edwin J. Brown. *Welding Journal*, v. 26, Oct. 1947, p. 867-871.

Step-by-step development of an improved procedure which has proven satisfactory in operation. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-639. Some Unusual Features Encountered in Investigating Cracked Welds in 35-15 Magnesium Retorts. H. J. Nichols. *Welding Journal*, v. 26, Oct. 1947, p. 881-884.

The methods used were statistical examination of data, metallographic examination of cracked welds, and temperature measurements of the retort in service. It was determined that the cracking of welds was due to higher than usual rigidity of retorts at the service temperature (resulting from increased carbon content), location of welds within a carbide-precipitation temperature zone, and loads on the retorts causing plastic strain and deformation of the weld metal. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-640. Directional Welding to Minimize or Eliminate Distortion in Weldments and Control Residual Stresses. Joseph Holt. *Welding Journal*, v. 26, Oct. 1947, p. 885-888.

Proper welding sequences and examples of their application. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-641. The Theory of Oxy-Arc Cutting. Hallock C. Campbell. *Welding Journal*, v. 26, Oct. 1947, p. 889-903.

Method and theory covering terminology, functions of the core, functions of the coating, rate of burn-off of the rod, rate of cutting mild steel, rate of oxygen consumption, application to stainless steels and oxidation-resistant alloys, economics of the operation, and future research requirements. 15 ref. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-642. Composite Alloy Fabrication With the Hidden Arc. H. E. Cable. *Welding Journal*, v. 26, Oct. 1947, p. 903-906.

Applications and advantages for surfacing or joining pieces of dissimilar composition. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-643. Arc Welding of Copper and Copper-Base Alloys. F. E. Garriott. *Welding Journal*, v. 26, Oct. 1947, p. 907-915.

Welding of the following most commonly used groups: copper; Cu-Sn alloys; Cu-Si alloys; Cu-Zn alloys; and Cu-Al-Fe alloys. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-644. The Maintenance Weldery. Cleo E. Hook. *Welding Journal*, v. 26, Oct. 1947, p. 915-917.

Author's conception of an ideal maintenance-welding shop. Organizational, equipment, and accounting setups. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-645. Distribution of Strength and Ductility in Welded Steel Plate as Revealed by the Static Notch Bar Tensile Test. W. F. Brown, Jr., L. J. Ebert, and G. Sachs. *Welding Journal*, v. 26, Oct. 1947, p. 545s-554s.

Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.

22-646. Effects of Section Size on the Static Notch Bar Tensile Properties of Mild Steel Plate. W. F. Brown, Jr., J. D. Lubahn, and L. J. Ebert. *Welding Journal*, v. 26, Oct. 1947, p. 554s-559s.

Effects on properties of a fully silicon-killed 0.25% carbon steel plate were investigated for geometrically similar notched bars tested in static tension. Results revealed a considerable decrease in notch strength from 110,000 psi. for the smallest specimen to 88,000 psi. for the largest specimen. The corresponding decrease in notch ductility was from 20% to only 2%. Data are compared with those reported previously by other investigators for steel, and possible explanations for the size effects discussed. 17 ref. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-647. Some Metallurgical Aspects of Carbon Steel Spot Welding. J. Heuschkel. *Welding Journal*, v. 26, Oct. 1947, p. 560s-582s.

Physical tests were made upon heat treated and untreated spot welded specimens to ascertain the influence of carbon content, thickness, and initial properties upon the tension-shear and direct-tension strengths of spot welds in carbon steels up to ½ in. in thickness and up to 1.09% in carbon content. Quench rates were studied indirectly from hardness and metallographic data. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-648. The Fundamentals of Spot Welding Steel Plate. W. F. Hess, W. D. Doty and W. J. Childs. *Welding Journal*, v. 26, Oct. 1947, p. 583s-593s.

Different welding variables were studied and from the results it was found possible to establish a general procedure for selection of optimum welding conditions for various thicknesses and types of materials. Development of control equipment, measuring techniques, and methods for testing the spot welds. Continuous welding is shown to be superior to pulsation welding, and dome-shaped electrode contacting surfaces were found to result in the best welds. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-649. Static-Strength Tests of Fillet Welds on Aluminum Alloy 61S-T Plate. R. L. Moore. *Welding Journal*, v. 26, Oct. 1947, p. 593s-600s.

Metal-arc welds in nominal sizes of ¼, ⅜, ½ and ¾ in. were investigated and a few samples of ½-in. argon-shielded tungsten-arc welds were included. Tests were made on specimens in the as-welded and reheat treated and aged conditions. The specimens were all of symmetrical, double butt-strap type, made of plates ranging from ⅜ to 1 in. in thickness. Lengths of individual welds ranged from 1½ to 6 in. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-650. Selection of Austenitic Electrodes for Welding Dissimilar Metals. Anton L. Schaeffler. *Welding Journal*, v. 26, Oct. 1947, p. 601s-620s.

The relation existing between the various compositions of electrodes and the relation of electrode to base metal revealed by using the Maurer microstructure diagram. A modified Newell-Fleischman equation is used to convert the austenite and ferrite-promoting minor elements into either chromium or nickel equivalents so that the alloy can be located on the chromium-nickel diagram. A method of predicting resultant weld-metal properties, when welding dissimilar metals, utilizes an innovation called "dilution direction lines". A method of using dilution direction lines for electrode specification to obtain definite structures in the weld metal. 17 ref. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-651. Semiautomatic Welding With Standard Manual Arc Welding Equipment. F. W. Myers, Jr. *Welding Journal*, v. 26, Oct. 1947, p. 626s-640s.

A process developed in Germany during the war, which is known as the copper-bar or Elin-Hafergut procedure. In this process, the electrode lies on the seam of a butt or fillet weld and is covered with a copper bar provided with a groove that encloses and shields the electrode. This results in a finished weld having an appearance which is usually very good. Paper is placed between the electrode and the work to help prevent movement of the electrode, to serve as insulation, and to absorb oxygen as it burns. Results of an extensive investigation of the process at Watertown Arsenal Lab. (Presented at 28th Annual Meeting, American Welding Society, Chicago, Oct. 1947.)

22-652. Mechanized Welding and Cutting Employed in Fabricating Heavy-Duty Earth Movers. Earl Griffeth. *Steel*, v. 121, Oct. 27, 1947, p. 80-84, 111, 114.

Equipment and procedures used by Wooldridge Mfg. Co., Sunnyvale, Calif. (Presented at Western Metal Congress, Oakland, Calif., March 26, 1947.)

22-653. Electrons Guide the Cutting Torch. T. H. Ayling. *Scientific American*, v. 177, Nov. 1947, p. 213-215.

How a photo-electric tracer, reading directly from an inexpensive drawing, controls the oxy-acetylene torch to cut from any pattern.

22-654. Cylinder Head Welding. T. B. Jefferson. *Welding Engineer*, v. 32, Nov. 1947, p. 33-35.

Repair-welding shop of Twin Cities Welding and Parts Co., Omaha.

22-655. Welding Railroad Passenger Cars. Part II. Arthur M. Unger. *Welding Engineer*, v. 32, Nov. 1947, p. 36-39, 43.

Fabrication of sides, ends, and roof at Pullman-Standard.

22-656. Mechanized Production Boosts Scraper Output. Earl Griffeth. *Welding Engineer*, v. 32, Nov. 1947, p. 44-48.

Mechanized welding and cutting in manufacture of heavy-duty earth scraper.

22-657. All-Welded Grain Loader. *Welding Engineer*, v. 32, Nov. 1947, p. 51.

Fabrication of screw conveyers and other steps in production of above at Snow Corp., Omaha.

22-658. Gas-Shielded Arc Processes. L. G. Pickhaver. *Welding Engineer*, v. 32, Nov. 1947, p. 52-55, 58.

Advantages and disadvantages of atomic-hydrogen, helium, and argon welding.

22-659. Welding Takes Gas Storage Underground. John H. Giroux. *Welding Engineer*, v. 32, Nov. 1947, p. 56-58.

Joining of individual sections for natural gas storage.

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Four Tables List Types of Alloys For Gas Turbines

Reported by Melvin R. Meyerson

National Bureau of Standards

Four tables listing the various types of heat resisting alloys used for gas turbines were projected and explained by C. T. Evans, Jr., chief metallurgist of the Elliott Co., in an address before the Washington Chapter ⊕ on Oct. 13.

The first table listed older high-temperature alloys which are used in the as-forged condition. The second table contained newer materials which are excellent for use up to 1500° F. and are susceptible to heat treatment. The third consisted of cast materials and the fourth listed some older and less complex high-temperature alloys which the speaker predicted will gradually find an increasingly prominent position in turbine usage. Brief histories and relative abilities of the alloys in the four tables were discussed.

Cut-away drawings were then shown to explain the operations and materials used in different parts of jet engines, a diesel engine turbocharger, and power gas turbines. The alloy forming each part was clearly labeled.

Mr. Evans also described tests used to evaluate the performance of these alloys and showed how the test results are recorded for use by designers, engineers, metallurgists, and others. Stress-rupture and creep data are of prime importance. However, these tests do not suffice for bolting material because the alloys exhibit different characteristics when they are used as bolts. Special bolt tests have been devised and include "step-down creep relaxation test", "constant-strain relaxation test", and also "rigid-frame relaxation setup".

Close control is considered essential in the manufacturing processes. To emphasize this point, Mr. Evans showed comparative property data on alloys that had a variety of casting conditions and different heat and working treatments. From these data, he concluded that at the present time the hot worked and heat treated bar stock gives the least variable results and is the safest on which to rely.

Mr. Evans concluded the lecture with an explanation of special practical problems involving such details as rates of thermal expansion, fatigue in moving parts, combined stresses, and thermal stresses in stationary parts.

Sperry Products Moves to Conn.

Sperry Products, Inc., manufacturers of supersonic and electrical nondestructive testing and measuring instruments, will move its manufacturing plant and general offices from Hoboken, N. J., to Danbury, Conn., during 1948.

Digges Succeeds McAdam At Bureau of Standards

Thomas G. Digges has been appointed chief of the thermal metallurgy section of the National Bureau of Standards, succeeding D. J. McAdam, who has been chief of the section since 1930. Dr. McAdam retired on Aug. 31, 1947.

T. G. Digges

Mr. Digges has been a member of the metallurgy division since 1920, and has made extensive studies on machinability, toolsteels, cutting tools, and thermal analysis and critical cooling rates of high-purity alloys of iron and carbon. During World War II, at the request of the National Defense Research Committee, he directed an investigation of the use of boron in steel, and, at the request of the Office of Production Research and Development, he also directed an investigation of the decarburization of alloy steel tubing used in aircraft.

Mr. Digges has written many technical papers, published in ⊕ *Transactions*, *Metal Progress* and elsewhere. He is a past chairman of the Washington Chapter ⊕, and has served on the society's national Publications Committee.

22-660. Arc-Welding Cable Data. *Welding Engineer*, v. 32, Nov. 1947, p. 67.

Data for arc welding electrode and ground cables and for portable cables between arc welder and power source.

22-661. Carbon Brazes Copper Parts. W. Scott. *American Machinist*, v. 91, Nov. 6, 1947, p. 98-100.

Use of carbon blocks to hold the parts to be brazed in intimate contact during heating and cooling and also to supply heat because of the resistance of carbon to the passage of electricity.

22-662. Furnace Brazing. H. D. Hendrick. *Automobile Engineer*, v. 37, Oct. 1947, p. 365-371.

A detailed review of production equipment and methods.

22-663. Spot Welded Aluminum Lap Joints Designed for Repeated Loads. Robert C. McMaster and Horace J. Grover. *Product Engineering*, v. 18, Nov. 1947, p. 112-116.

A series of fatigue tests of spot welded lap joints to determine the influence of spot size, sheet thickness, and spot pattern on fatigue strength. Typical radiographs. (Results of wartime research at Battelle Memorial Institute.)

22-664. Kolene Process Aids Silver Brazing of Cast Iron. E. Russell Atkinson. *Iron Age*, v. 160, Nov. 6, 1947, p. 85.

The Kolene process is a combined cleaning and surface preparation method that produces a pure ferrite surface, which is necessary in order to silver braze cast iron to steel. It is a catalyzed molten-salt bath, melting point 500° F., and operating range of 850 to 950° F., plus a sequence of oxidation and reduction cycles regulated according to size and shape of parts and surface desired. Application to silver brazing of a cast-iron cylinder to a steel stamping to withstand a 300 ft-lb. torque test, and an air test for leakage.

For additional annotations indexed in other sections, see: 3-344; 11-178; 23-426-458-466; 24-354; 27-241-242-248-249.

23 INDUSTRIAL USES and Applications

23-423. Studebaker Adds Starter Ring Gears to Its In-Plant Manufacture. P. D. Aird. *Modern Industrial "Press"*. v. 9, Oct. 1947, p. 13-14.

Welding, heat treatment, and forming procedures in fabrication of the above.

23-424. Presswork Produces Over One-Third of Parts for Magic Chef Gas Range. Walter Rudolph. *Modern Industrial "Press"*, v. 9, Oct. 1947, p. 18, 20, 22, 24.

Materials handling, shearing, stamping, welding, and inspection.

23-425. Production of Costume Jewelry for Motion Picture Studios. Thomas A. Dickinson. *Modern Industrial "Press"*, v. 9, Oct. 1947, p. 26, 28, 44.

Forming, trimming, annealing, brazing, and finishing procedures.

23-426. Fabrication of Yoder Refrigeration Plates. Sanford Markey. *Modern Industrial "Press"*, v. 9, Oct. 1947, p. 30, 34.

Above plates consist of two 16-gage cold rolled steel plates, one embossed and one flat, welded together to form a network of channels for flow of refrigerant, and providing high refrigeration efficiency. Fabrication procedures, including welding and finishing.

23-427. Aluminum Alloys. R. H. Brown and E. D. Verink, Jr. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 1198-1201.

Recent developments in the use of the above for chemical-plant construction. 37 ref.

23-428. Wrought Copper and Copper-Base Alloy. C. L. Bulow. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 1204-1210.

Recent developments in their use for chemical-plant construction. 40 ref.

23-429. Iron, Mild Steels, and Low Alloy Steels. R. B. Mears and S. C. Snyder. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 1219-1224.

Recent developments in their use for chemical-plant construction. 134 ref.

23-430. Lead, Tin, Zinc, and Their Alloys. George O. Hiers. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 1224-1228.

Recent developments in their use for chemical-plant construction. 77 ref.

23-431. Nickel and High-Nickel Alloy. W. Z. Friend. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 1228-1234.

Recent developments in their use for chemical-plant construction. 99 ref.

23-432. Stainless Steels and Other Ferrous Alloys. M. H. Brown and W. B. DeLong. *Industrial and Engineering Chemistry*, v. 39, Oct. 1947, p. 1248-1254.

Recent developments in the use of the above for chemical-plant construction. 165 ref.

23-433. Coal Wagons. *Iron and Steel*, v. 20, Oct. 1947, p. 483-484.

American experience with low-alloy steels for construction of railroad coal cars.

23-434. Wrought Aluminum Sink. *Light Metals*, v. 10, Oct. 1947, p. 495-497.

Service results based on 20 months under domestic conditions.

23-435. World's Largest Door. *Light Metals*, v. 10, Oct. 1947, p. 532-535.

Details of aluminum-alloy hangar door, 65.75 ft. high, and 1045 ft. wide.

23-436. In the Service of Science. (Continued.) *Light Metals*, v. 10, Oct. 1947, p. 536-539.

The use of aluminum in recording and measuring instruments for receiving parts, dials, and reflectors. (To be concluded.)

23-437. Survey Finds: "Chrome Plating Well Suited to Piston Rings". *SAE Journal*, v. 55, Oct. 1947, p. 33-35.

Based on "Chrome Plating to Reduce Wear—A Survey of Fleet Operators' Experience", by H. O. Mathews.

23-438. Aluminum Truck Bodies Trim Operational Costs. *SAE Journal*, v. 55, Oct. 1947, p. 58-59.

Based on "Light Weight Bodies of Aluminum for Trucks". (Presented at S.A.E. National Transportation & Maintenance Meeting, Chicago, Oct. 17, 1946.)

23-439. Stainless Steel Units Boost Fleet Revenue. *SAE Journal*, v. 55, Oct. 1947, p. 60.

Advantages found to exist. (Based on "Light Steel Body Construction", by V. M. Drew, presented at S.A.E. Southern California Section, Los Angeles, April 24, 1947.)

23-440. When Parts Should Be Die Castings Rather Than Stampings. Herbert Chase. *Materials & Methods*, v. 26, Oct. 1947, p. 87-91.

Some examples where die castings have proved more economical.

23-441. The Bristol Brabazon. *Aircraft Production*, v. 9, Oct. 1947, p. 370-377.

Procedure adopted for the extremely heavy riveting of the inner wing and also the arrangement of, and some of the manufacturing problems associated with, the power-unit bays of the above plane.

23-442. Airframe Production: A Review of Wartime Manufacture by the British Aircraft Industry. Part II. Actual Production Methods and Results; Labor Efficiency and Costs; Over-All Production Costs. Eric Mensforth. *Aircraft Production*, v. 9, Oct. 1947, p. 388-395.

Comparative value of various manufacturing systems employed during the years of maximum effort both in Britain and in the U. S.

23-443. Production Planning Keynotes the Manufacture of the Quality Range. *Better Enameling*, v. 18, Oct. 1947, p. 13-18.

Plant procedures, equipment, and layout.

23-444. Light Alloy Spools and Reels. F. A. Rappleyea. *Modern Metals*, v. 3, Oct. 1947, p. 14-16.

Comparative mechanical properties of different structural metals and of spools made from them.

23-445. Aluminum Castings for Oil Burners Cut Costs. Wm. F. Klockau. *Modern Metals*, v. 3, Oct. 1947, p. 19.

Experience of Nu-Way Corp., Rock Island, Ill.

23-446. Aluminum for Rotobowling Equipment. *Modern Metals*, v. 3, Oct. 1947, p. 24-25.

Construction of balls and equipment for new game. Players use an aluminum "discharge machine" to roll an aluminum ball.

23-447. Magnesium for Textiles: Roving Spools; Wool Bins; Lay Beams. J. Walraven. *Modern Metals*, v. 3, Oct. 1947, p. 29-30.

Applications to textile manufacturing.

23-448. Aluminum Piping for Portable Irrigation Systems. *Modern Metals*, v. 3, Oct. 1947, p. 30.

23-449. Light Alloy Utility Service Equipment. R. A. O'Neill. *Modern Metals*, v. 3, Oct. 1947, p. 33-34.

Use of light alloys for ladders.

23-450 Aluminum Talk Around Detroit. *Modern Metals*, v. 3, Oct. 1947, p. 35.

New and planned uses by Ford and Kaiser-Frazer.

23-451. Recent Developments in Magnesium Products. C. H. Mahoney. *Modern Metals*, v. 3, Oct. 1947, p. 36-39.

A review.

23-452 Coach Baggage Cars Made Principally of Aluminum. *Modern Metals*, v. 3, Oct. 1947, p. 40.

23-453. Compressed Air Employed in Many Ways in "Convair-240" Assembly. *Steel Processing*, v. 33, Oct. 1947, p. 606-608.

Application to miscellaneous machines.

23-454. Pressed Metal Advances Aid Household Equipment Manufacturers. *Steel Processing*, v. 33, Oct. 1947, p. 614-617.

Applications to miscellaneous products.

23-455. Porcelain Enameled Structures—An Engineered Product. F. L. Meacham. *Engineering Experiment Station News (Ohio State University)*, v. 19, Oct. 1947, p. 13-16.

Applications.

23-456 Bimetallic Plates. Part IV. J. S. Mertle. *National Lithographer*, v. 54, Oct. 1947, p. 34-35.

Some of the more recent attempts to produce a better plate for lithography.

23-457. Aluminum Wave Guides for Lightweight Communications Equipment. Robert Sherman. *Communications*, v. 27, Oct. 1947, p. 28, 30-31, 34-35.

Lightweight wave guides employ new techniques in bending, brazing, and plating for aeronautical, mobile, and personal applications.

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NATIONAL MEETINGS

for January

Jan. 12-13—Industrial Furnace Manufacturers Association, Inc. Midwinter Meeting, Hotel Schenley, Pittsburgh. (I.F.M.A., 420 Lexington Ave., New York City.)

Jan. 12-16—Society of Automotive Engineers, Inc. Annual Meeting, Book-Cadillac Hotel, Detroit. (John A. C. Warner, secretary and general manager, S.A.E., 29 West 39th St., New York 18.)

Jan. 12-16—Second National Materials Handling Exposition, Public Auditorium, Cleveland. (Clapp & Poliak, 350 Fifth Ave., New York City.)

Jan. 13-14—American Society of Mechanical Engineers. Special national session of Materials Handling and Management Divisions, Hotel Statler and Public Auditorium, Cleveland. (D. K. Wright, Case Institute of Technology, Cleveland.)

Jan. 26-29—Refrigeration Equipment Manufacturers Association. Fifth All-Industry Refrigeration and Air Conditioning Exposition, Public Auditorium, Cleveland. (Theodore R. Sills & Co., 39 South LaSalle St., Chicago 3.)

Southern Tier Starts Course

Reported by Floyd B. Allen

Tool Engineer, Remington Rand, Inc.

A course in the fundamentals of metallurgy was inaugurated on Nov. 18 at Elmira, N. Y., as an activity of the Education Committee of the Southern Tier Chapter. W. J. Connelly, formerly of the University of Rochester and now with Carpenter Steel Co., is conducting the series of lectures, and James Ryan of Eclipse Machine Division at Elmira is in charge of the project. A similar program is planned for the Binghamton, N. Y., area.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Jan. 14	Akron Elks Club	A. J. Scheid, Jr.	Toolsteel—the Key to Efficient Production
Baltimore	Jan. 19	Engineers Club	B. F. Shepherd	Hardenability of Shallow Hardening Steels Determined by the PV Test
Boston	Jan. 9	Sheraton Hotel	Lee H. DeWald	Cemented Carbides and Their Proper Application
Buffalo	Jan. 8	Hotel Statler	F. B. Foley	Alloys for Elevated Temperature Service
Calumet	Jan. 13	Phil Smidt & Sons, Hammond, Ind.	Peter Payson	Annealing of Steel
Cedar Rapids	Jan. 13	Hotel Roosevelt	H. A. Wilhelm	Atomic Energy
Chicago	Jan. 12	Museum of Science and Industry	R. L. Templin	Determination and Significance of Mechanical Test of Metals
Cincinnati	Jan. 8	Engineering Society	R. P. Koehring	Powdered Metals
Cleveland	Jan. 5	Cleveland Club	R. S. Burns	Cold Forming and Deep Drawing of Iron and Steel Sheets
Columbus	Jan. 13	Ft. Hayes Hotel	Henry Burghoff	Functions of Common Alloying Elements in Wrought Copper Alloys
Dayton	Jan. 14	Miami Hotel	Wm. Schneble	Cast Iron
Des Moines	Jan. 13		Norbert Koebel	Copper Furnace Brazing
Detroit	Jan. 12		R. S. Archer	European Reactions to Some American Metallurgical Concepts
Fort Wayne	Jan. 12	Chamber of Commerce	Peter Payson	Annealing Production Steels for Machines
Georgia	Jan. 5	Atlantic Steel Co.	C. H. Vaughan	Metals in Every-Day Use
Hartford	Jan. 13	Hartford Trade School	V. E. Lysaght	Microhardness Testing of Metals
Indianapolis	Jan. 19		A. J. Pepin	Production and Heat Treatment of Quality Forgings
Los Angeles	Jan. 22	So. Calif. Gas Co. Auditorium	M. A. Scheil	Relation of Heat Treatment to the Welding of Ferrous Materials
Mahoning Valley	Jan. 20			Past Chairmen's Night (Information Please)
Milwaukee	Jan. 20	City Club of Milwaukee	F. B. Foley	Alloys for Elevated Temperature Service
Montreal	Jan. 5	Queen's Hotel	Peter Payson	Modern Viewpoint of Annealing of Steel
Muncie	Jan. 20	Muncie Central High School		Information Please
New Jersey	Jan. 19	Essex House, Newark	K. C. Compton	Corrosion of Metals
New York	Jan. 12	Bldg. Trades Club	Wm. Mudge	Age Hardening of Nickel Alloys
			Robert Carson	Age Hardening of Aluminum and Copper Alloys
North West	Jan. 15	Covered Wagon	P. Payson	Cyclic Annealing
Notre Dame	Jan. 14	Engineering Auditorium, University of Notre Dame	Arthur E. Focke	Manufacture and Metallurgy of Roller Chains
Ontario	Jan. 9	Royal York Hotel, Toronto	F. G. Tatnall	Physical Testing Up-to-Date and Simplified
Ottawa Valley	Jan. 6	P.M.R. Lab, Bureau of Mines	F. G. Tatnall	Physical Testing
Philadelphia	Jan. 30	Engineers' Club	C. A. Zapffe	Gases in Metals
Pittsburgh	Jan. 8	Mellon Institute Auditorium	Karl Fetters	Slag Control in Economics of Steel Production
Rochester	Jan. 7	Powers Hotel		National Officers' Night
Rocky Mountain	Jan. 15	Pueblo Whitman Hotel	T. G. Foulkes	Metallurgical Experiences in Europe
	Jan. 16	Denver Oxford Hotel		
Saginaw Valley	Jan. 20	Fischer's Hotel, Frankenmuth	Frank Ross	Lubrication
St. Louis	Jan. 22	Engineers Club	H. L. Walker	Education of Engineering Students
Syracuse	Jan. 6	Onondaga Hotel	C. J. Oxford	Modern Metal Cutting
Terre Haute	Jan. 12	Indiana State	A. Wm. Schneble	Metallurgy of High-Strength Gray Iron
Texas	Jan. 6	Ben Milam Hotel, Houston	J. T. MacKenzie	Engineering Properties of Cast Irons
Toledo Group	Jan. 22	Maumee River Yacht Club	Waldemar Naujoks	Modern Forging Methods
Tulsa	Jan. 13	Spartan Cafeteria	O. J. Horger	What the Metallurgist Should Know About Design
Washington	Jan. 12	Dodge Hotel, Garden House	A. J. Pepin	Large Light Metal Forgings
West Michigan	Jan. 19	Rowe Hotel	F. F. Vaughn	Induction Hardening
Worcester	Jan. 14	Sanford Riley Hall, Worcester Polytechnic Institute	Hans Ernst	Principles of Machinability

23-458. This Mixes Things up—but Good. *Weld* (formerly *Victor Weld*), v. 3, Oct. 1947, p. 6-8.

An all-welded, mobile, pug-mill-type concrete mixer.

23-459. Staybolt Application and Maintenance. *Railway Mechanical Engineer*, v. 121, Oct. 1947, p. 574-576.

Tentative specifications covering the threading of staybolts and the tapping of sheets and round nuts. Shop and enginehouse procedures are given. (Presented at Meeting of Master Boiler Makers' Association, Chicago, Sept. 15-18, 1947.)

23-460. High-Temperature Exhaust Harnessed by Ryan. G. E. Barton. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 66-69, 103, 111.

Fabrication of exhaust equipment for the latest Boeing, Douglas, Convair, Fairchild, Lockheed, Northrop, North American, and Martin aircraft by Ryan Aeronautical Co.

23-461. Cranes, Bridges and Steel Structures. Ralph G. Paul. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 74-79.

Structural steel fabrication by Judson Pacific-Murphy Corp., Emeryville, Calif.

23-462. Automobile Wheels by Norris. *Western Machinery and Steel World*, v. 38, Oct. 1947, p. 88-90.

Materials handling and fabrication procedures.

23-463. Modern Box Fabrication. Walter Rudolph. *Sheet Metal Worker*, v. 38, Oct. 1947, p. 45-46.

Procedures and equipment for fabrication of sheet metal boxes.

23-464. Lighter Making Involves Many Metalworking Procedures. *Steel*, v. 121, Oct. 27, 1947, p. 77-78.

156 operations which include welding, heat treating, soldering, and several special press actions are required to manufacture a cigarette lighter.

23-465. Steels Classified for Automotive Gears. J. R. England and O. F. Hager. *Automotive Industries*, v. 97, Nov. 1, 1947, p. 38, 74, 76.

Table summarizes the properties of most of the steel types and treatments used in present-day gear manufacture, showing their applicability to various automotive, aircraft and machine tool gears. Super Kore steels made by Carnegie-Illinois are recommended for heavy-duty service to replace certain more highly alloyed steels.

23-466 Pullman-Standard Delivers First Box Cars Built to P-S-1 Design. *Railway Age*, v. 123, Nov. 1, 1947, p. 33-36.

Fabrication of new 50-ton units, constructed mainly of welded open-hearth steel.

23-467. "Harnessed" Air in the Metalworking Industry. *Steel*, v. 121, Nov. 3, 1947, p. 94-98, 100, 102, 121-122.

From Compressed Air Handbook, Compressed Air & Gas Institute, New York.

For additional annotations indexed in other sections, see: 3-346-354-355-365; 5-72; 8-157; 19-399.

597 brief digests covering all published developments in this field during 1946 appear in Vol. 3, ASM Review of Metal Literature. Vols. 1, 2 and 3 together give you three-year index to the metal industry. Each Vol. $10.00 to ASM Members. $15.00 to Nonmembers. American Society for Metals, 7301 Euclid Ave., Cleveland 3.

24 DESIGN

24-352. Calculating the Cams for Automatic Lathes With Movable Headstock. André Daetwyler. *Microtecnic*, v. 1, Aug. 1947, p. 81-83. (English section.) (For figures see French section, p. 184-188.)

Details of process. (To be continued.)

24-353. Analytical and Experimental Investigation of Bolted Joints. Samuel J. Rosenfeld. *National Advisory Committee for Aeronautics Technical Note No. 1458*, Oct. 1947, 48 p.

A recurrence formula which in conjunction with the appropriate boundary equations can be used for calculation of bolt-load distribution for joints of uniform dimensions with bolts in line with the load. A procedure in which the recurrence formula is applied as a homogeneous finite-difference equation of the second order. In addition, an approximate analysis which may be used in most practical designs. An example demonstrates the use of the shear-lag solution and a comparison is made with other methods of analysis. The second part describes strain-gage tests for joints with five and nine bolts in line.

24-354. Effect of Variation in Diameter and Pitch of Rivets on Compressive Strength of Panels With Z-Section Stiffeners; Panels of Various Stiffener Spacings That Fail by Local Buckling. Norris F. Dow and William A. Hickman. *National Advisory Committee for Aeronautics Technical Note No. 1467*, Oct. 1947, 28 p.

24-355. Impact Tests on Two Truss Spans; Toledo Terminal Railroad. *American Railway Engineering Association Bulletin*, v. 49, Sept-Oct. 1947, p. 1-58.

A description and analysis of tests made on one 142-ft. deck span and one 250-ft. through draw span. The tests were made under steam locomotives and freight cars operating at speeds from 10 to 43 miles per hr. The stresses were measured by means of electromagnetic strain gages with oscillograph recording.

24-356. Designing of "Trouble-Free" Dies. Part LXXIV. Modern Engineering Trends in Presswork. C. W. Hinman. *Modern Industrial "Press"*, v. 9, Oct. 1947, p. 16, 44.

24-357. Convair's Celstrain Gages. *Modern Industrial "Press"*, v. 9, Oct. 1947, p. 40, 42.

The above are wafer-thin electrical units designed to facilitate the testing of press-formed aircraft parts by providing accurate indications of localized surface strains due to compressive or tensional loads.

24-358. S.A.E. Involute Splines and Applied Involutometry. Part I. Merton W. Seavey. *Tool Engineer*, v. 19, Oct. 1947, p. 17-22.

Clarifies involute splines for the shop man as applicable to the 1946 S.A.E. Standard and to provide sufficient fundamental data to enable him to continue his study of splines, or to branch over into gearing. Interpretation of the formulas used to establish the values given in the tables. (To be concluded.)

24-359. Strain Gaging. *Iron and Steel*, v. 20, Oct. 1947, p. 492-493.

Application to investigation of behavior of materials in service.

24-360. Torsion Bars for Commercial Vehicles. N. E. Bateson. *SAE Quarterly Transactions*, v. 1, Oct. 1947, p. 549-556; discussion, p. 556-558.

Troubles experienced with conventional types of spring suspension in commercial vehicles could be diminated by use of the torsion-bar type. (Presented at S.A.E. National Transportation Meeting, Chicago, April 17, 1947.)

24-361. Reducing Failures in Metal Parts. Arthur E. Focke. *Mining and Metallurgy*, v. 28, Oct. 1947, p. 495-497.

What a practicing metallurgist needs to know about design. He should be able to combine design knowledge with knowledge of metals in order to achieve the best practical solutions for problems.

24-362. Standard-Unit Tooling. *Aircraft Production*, v. 9, Oct. 1947, p. 378-380.

A practical system for jig and fixture assembly from stock parts.

24-363. Kinematics of Disk Cam and Flat Follower. Allan H. Candee. *Transactions of the A.S.M.E.*, v. 69, Oct. 1947, p. 709-718; discussion, p. 718-724.

The practicability of determining the proper shape of cam to produce a required motion by means of "geometrical kinematics". The general principles of geometry and kinematics can be applied, and the graphical method is not limited to determining a cam profile as the envelope of the follower.

24-364. Application of Tables for Helical Compression and Extension Spring Design. H. F. Ross. *Transactions of the A.S.M.E.*, v. 69, Oct. 1947, p. 725-734.

Tables developed for all standard steel-wire gages between 0.025 and 0.394 in., music-wire gages between 0.010 and 0.118 in., and most even fractional dimensions. Design considerations, and limitations, together with examples of the application of the tables.

24-365. A New Technique in the Construction of Major Assembly Jigs. Donald Paterson. *Sheet Metal Industries*, v. 24, Oct. 1947, p. 2035-2040, 2046.

Use of Cerromatrix, an easily fusible bismuth-rich alloy, for the setting of important location points. The properties and behavior on cooling of Cerromatrix, and procedures for its use.

24-366. Some Design and Structural Features of the Tucker. W. B. Griffin. *Modern Metals*, v. 3, Oct. 1947, p. 20-22.

Some of the design and structural features being incorporated into new car bodies for the first models, which may be stretch formed.

24-367. Brittle Lacquer Stress Analyzers. C. W. Smith. *Paint Manufacture*, v. 17, Oct. 1947, p. 333-338, 342.

Physical and chemical requirements which such coatings must fulfill, the basic formulations and optimum application conditions of suitable lacquers, types of test for which they are suitable, and results obtainable by their use.

24-368. Strain Gage Testing. *British Steelmaker*, v. 13, Oct. 1947, p. 528-530.

Research carried out by Vauxhall Motors, Ltd.

24-369. Instability Analysis and Design of an Efficiently Tapered Plate Under Compressive Loading. Samuel Pines and George Gerard. *Journal of the Aeronautical Sciences*, v. 14, Oct. 1947, p. 594-599; discussion, p. 599-600.

Design of a nonbuckling tapered plate acting under various compressive loadings is considered for both the elastic case and one in which a region is operating at stresses above the proportional limit.

24-370. Redesigning for Light Metals. William Graf. *Light Metal Age*, v. 5, Oct. 1947, p. 10-13, 20.

Redesign for aluminum of 5-ton crane with 50-ft. span.

24-371. Use of Oval Angle-Iron Holes Prevents Damage. *Sheet Metal Worker*, v. 38, Oct. 1947, p. 58.

Assembly of sheet-metal ductwork. Oval holes facilitate lining up of the holes in matching sections.

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